Technical training.
Product information.

G12 Voltage Supply and Bus Systems

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BMW Group University
Technical Training
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General information

Symbols used

The following symbol is used in this document to facilitate better comprehension or to draw attention to very important information:

Contains important safety information and information that needs to be observed strictly in order to guarantee the smooth operation of the system.

Information status and national-market versions

BMW Group vehicles meet the requirements of the highest safety and quality standards. Changes in requirements for environmental protection, customer benefits and design render necessary continuous development of systems and components. Consequently, there may be discrepancies between the contents of this document and the vehicles available in the training course.

This document basically relates to the European version of left hand drive vehicles. Some operating elements or components are arranged differently in right-hand drive vehicles than shown in the graphics in this document. Further differences may arise as the result of the equipment specification in specific markets or countries.

Additional sources of information

Further information on the individual topics can be found in the following:

- Owner's Handbook
- Integrated Service Technical Application.

Contact: conceptinfo@bmw.de

The information contained in this document forms an integral part of the technical training of the BMW Group and is intended for the trainer and participants in the seminar. Refer to the latest relevant information systems of the BMW Group for any changes/additions to the technical data.

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G12 Voltage Supply and Bus Systems

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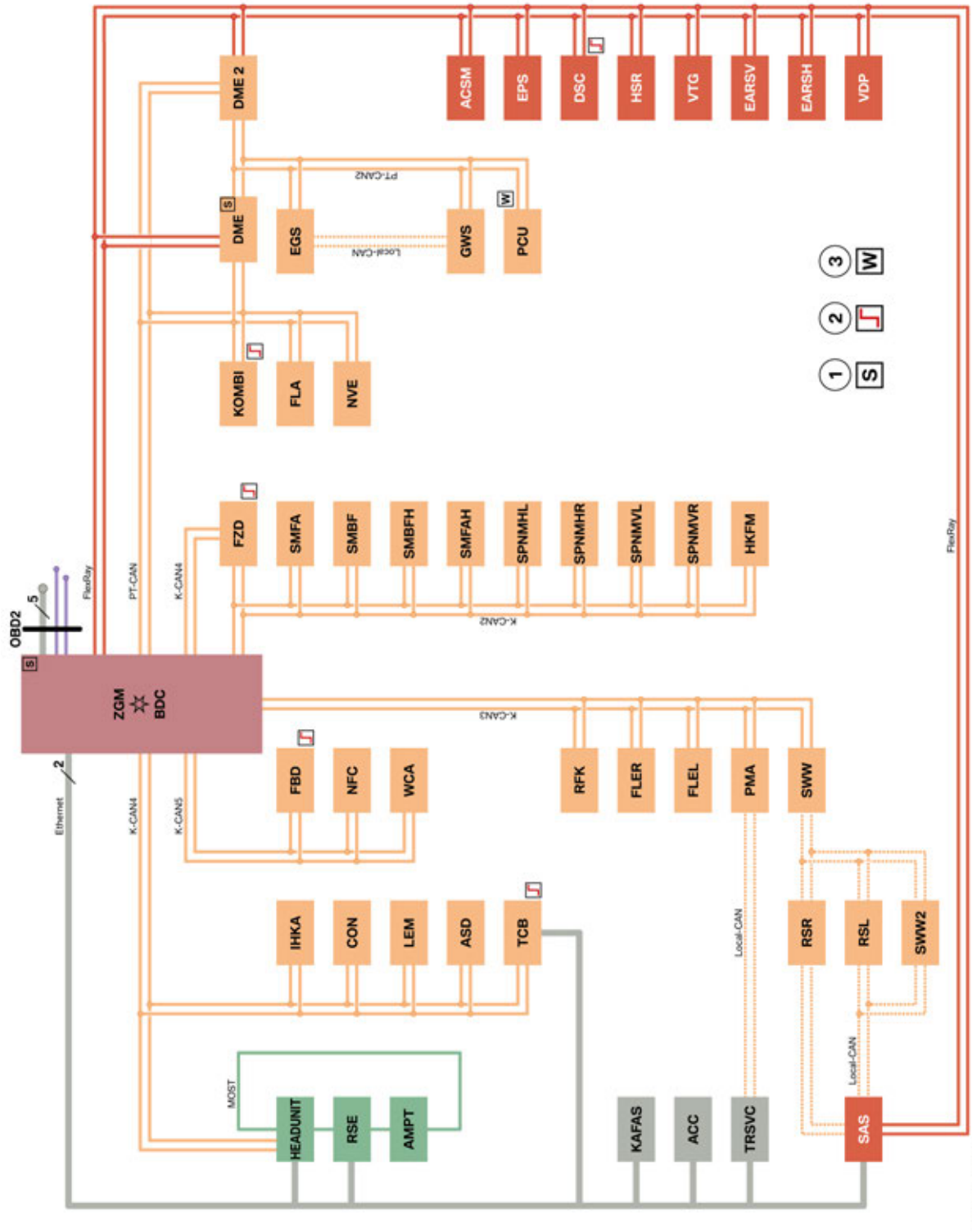
1. Bus Systems

1.1. Bus overview



Bus overview

G12 Voltage Supply and Bus Systems

1. Bus Systems

Index	Explanation
ACC	Active cruise control
ACSM	Advanced Crash Safety Module
AMPT	Top Hi-Fi amplifier
ASD	Active Sound Design
BDC	Body Domain Controller
CON	Controller
DME	Digital Motor Electronics
DME2	Digital Engine Electronics 2
DSC	Dynamic Stability Control
EARSH	Electric Active Roll Stabilization rear
EARSV	Electric Active Roll Stabilization front
EGS	Electronic transmission control
EPS	Electromechanical Power Steering
FBD	Remote control service
FLA	High-beam assistant
FLER	Front Light Electronics Right
FLEL	Front Light Electronics Left
FZD	Roof function center
GWS	Gear selector
HEADUNIT	Head unit
HKFM	Tailgate function module
HSR	Rear axle slip angle control (Rear steering module)
IHKA	Integrated automatic heating / air conditioning
KAFAS	Camera-based driver support systems
KOMBI	Instrument panel
LEM	Light Effect Manager
NFC	Near Field Communication
NVE	Night Vision Electronics
PCU	Power Control Unit
PMA	Parking Manoeuvre Assist
RFK	Reversing camera
RSE	Rear Seat Entertainment
RSL	Radar Sensor Left (avoidance assistant)
RSR	Radar Sensor Right (avoidance assistant)
SAS	Optional equipment system

G12 Voltage Supply and Bus Systems

1. Bus Systems

Index	Explanation
SMBF	Seat module, passenger
SMBFH	Seat module, passenger, rear
SMFA	Seat module, driver
SMFAH	Seat module, driver, rear
SPNMHL	Seat pneumatics module back left
SPNMHR	Seat pneumatics module back right
SPNMVL	Seat pneumatics module front left
SPNMVR	Seat pneumatics module front right
SWW	Blind spot detection (primary)
SWW2	Blind spot detection (secondary)
TCB	Telematic Communication Box
TRSVC	Top Rear Side View Camera
VDP	Vertical Dynamics Platform
VTG	Transfer box
WCA	Wireless charging tray
ZGM	Central gateway module
1	Start-up node control units for starting and synchronizing the FlexRay bus system
2	Control units with wake-up authorization
3	Control units also connected at terminal 15WUP

1.2. Main bus systems

1.2.1. K-CAN

The following K-CANs are used in the G12:

- K-CAN2
- K-CAN3
- K-CAN4
- K-CAN5

The control units on the K-CAN5 are not displayed in the bus overview by the BMW diagnosis system ISTA. Diagnosis is performed via the Body Domain Controller.

All K-CAN data buses have a data transfer rate of 500 kBit/s.

G12 Voltage Supply and Bus Systems

1. Bus Systems

1.2.2. PT-CAN

The following PT-CANs are used in the G12:

- PT-CAN
- PT-CAN2

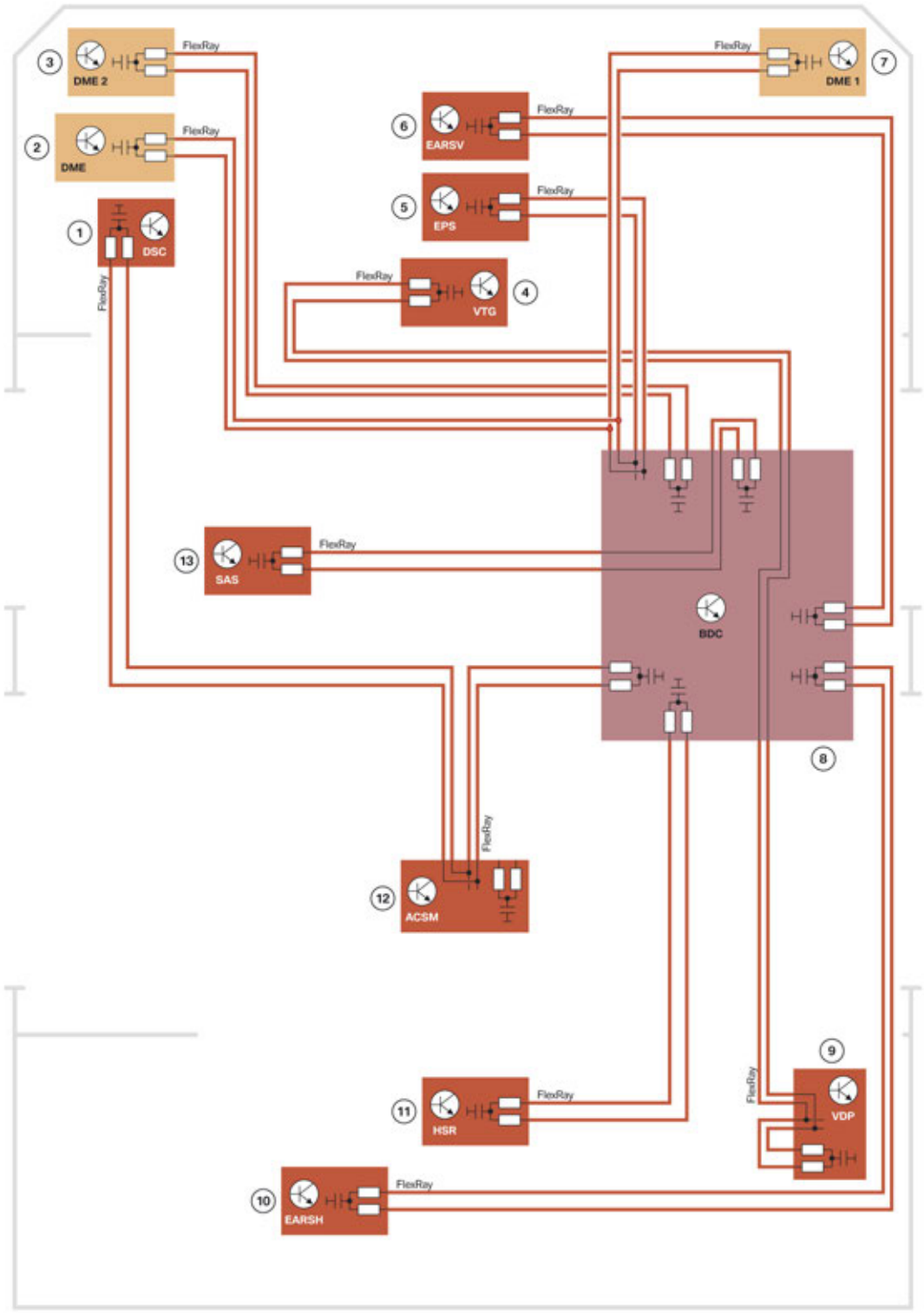
The gateway for the PT-CAN2 is located in the DME.

Both PT-CAN data buses have a data transfer rate of 500 kBit/s.

G12 Voltage Supply and Bus Systems

1. Bus Systems

1.2.3. FlexRay



FlexRay

G12 Voltage Supply and Bus Systems
1. Bus Systems

Index	Explanation
1	Dynamic Stability Control (DSC)
2	Digital Motor Electronics (DME) (only 6-cylinder engines)
3	Digital Motor Electronics 2 (DME2) (only 8-cylinder engines)
4	Transfer box
5	Electronic Power Steering (EPS)
6	Electric active roll stabilization front (EARSV)
7	Digital Motor Electronics 1 (DME1) (only 8-cylinder engines)
8	Body Domain Controller (BDC)
9	Vertical Dynamics Platform (VDP)
10	Electric Active Roll Stabilization rear (EARSH)
11	Rear axle slip angle control (HSR)
12	Advanced Crash Safety Module (ACSM)
13	Optional equipment system (SAS)

The FlexRay overview includes all engine versions and optional equipment. The DME (item 2) is present for 6-cylinder engines. DME1 (item 7) and DME2 (item 3) are present for 8-cylinder engines. The terminating resistors for line termination are located in the DME units and in the Body Domain Controller.

The FlexRay has a data transfer rate of 10 MBit/s.

1.2.4. Ethernet

Ethernet with 5 lines or 4 lines

Ethernet was already used with 5 lines in the F01 for vehicle programming and for the map update of the navigation system (4 data lines and 1 line for interface activation). In the F01 there is an additional Ethernet connection from the head unit to the Rear Seat Entertainment (RSE) with 4 data lines for transmission of the navigation data for the RSE.

Both Ethernet variants are comparable with the standard Ethernet variant 100BASE–TX in PC networks. The Ethernet version with 5 lines is still used in the G12 from the OBD2 interface to the Body Domain Controller.

Ethernet with 2 lines

A new Ethernet with two lines is used for communication in the G12.

This two-wire, twisted and unshielded bus line was developed by the OPEN Alliance BroadR-Reach. At BMW, this Ethernet is called OABR Ethernet and has been adapted for the automotive sector.

The data rate for an OABR Ethernet connection is up to 2 x 100 Mbit/s.

G12 Voltage Supply and Bus Systems

1. Bus Systems

Hardware advantages

One advantage is the transmission of vehicle camera data. Vehicle cameras (IP-based) are not connected to one control unit , but several control units by Ethernet which allows these units to access the camera data flow efficiently. The network is therefore very flexible and is well prepared for the future.

Another important advantage is the fast programming of control units. The programming times are reduced significantly via Ethernet. Whereas a CAN bus can only transmit data with a maximum length of 8 bytes per message, Ethernet messages have a length of over 1500 bytes. The user data rate thus increases: Considerably more message packages can be transmitted in a shorter period.

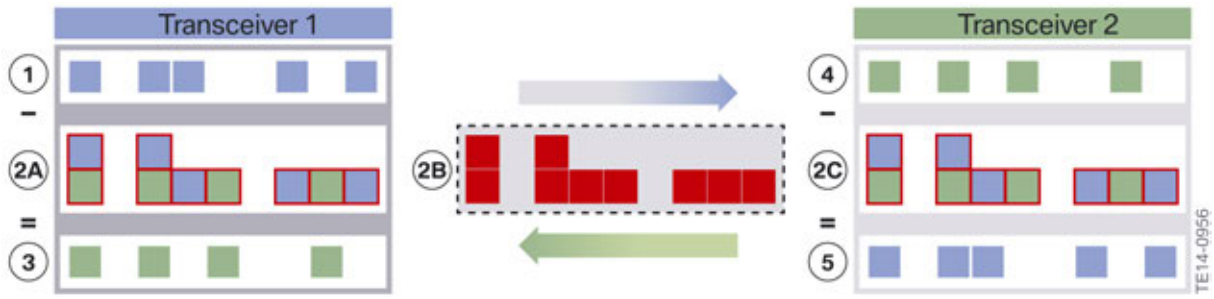
The OABR Ethernet connection equates to additional weight and cost savings, due to only using 2 wires.

Data transfer

For data transfer in the standard Ethernet 100BASE-TX, one line pair is needed for transmitting data and one pair for receiving.

In contrast to the standard Ethernet described above, with the OABR Ethernet the data is now transmitted with one line pair. This means with the 2-wire OABR Ethernet, a simultaneous transmit-receive mode is done via each of the two single pair cables. The two lines transmit a sum signal differentially. If a line is interrupted, a signal can no longer flow back through the second wire via the differential transmission. A symmetrical transmission would thus no longer be possible, the communication via the data bus comes to a standstill.

During the transmission, messages with 100 MBit/s are transmitted simultaneously in both directions via the lines. In total, this gives a maximum transmission speed of 200 MBit/s of data. In the transceiver, the transmitted message is subtracted from the bus signal. The result is the message of the opposite transceiver. A schematic diagram of the transceiver of the OABR Ethernet shows how the data exchange takes place:



Transceiver in the OABR Ethernet schematic diagram

Index	Explanation
1	Message from transceiver 1
2A, 2B, 2C	Message on the OABR Ethernet
3	Subtracted message from transceiver 2
4	Message from transceiver 2
5	Subtracted message from transceiver 1

G12 Voltage Supply and Bus Systems

1. Bus Systems

Layer model

The message transmission follows the rules which were defined for the conventional Ethernet 100BaseTX. The bodies on the transmitter and receiver side must work according to these defined rules so that they agree how the data is to be processed.

With the Ethernet, the Open Systems Interconnection model is used (OSI model).

It comprises 7 layers:

- Layer 1: Physical layer with 100 MBit/s
- Layer 2: Link (device driver, hardware)
- Layer 3: Network (package delivery, routing)
- Layer 4: Transport (package security, encryption)
- Layers 5-7 Applications (user applications and processes)

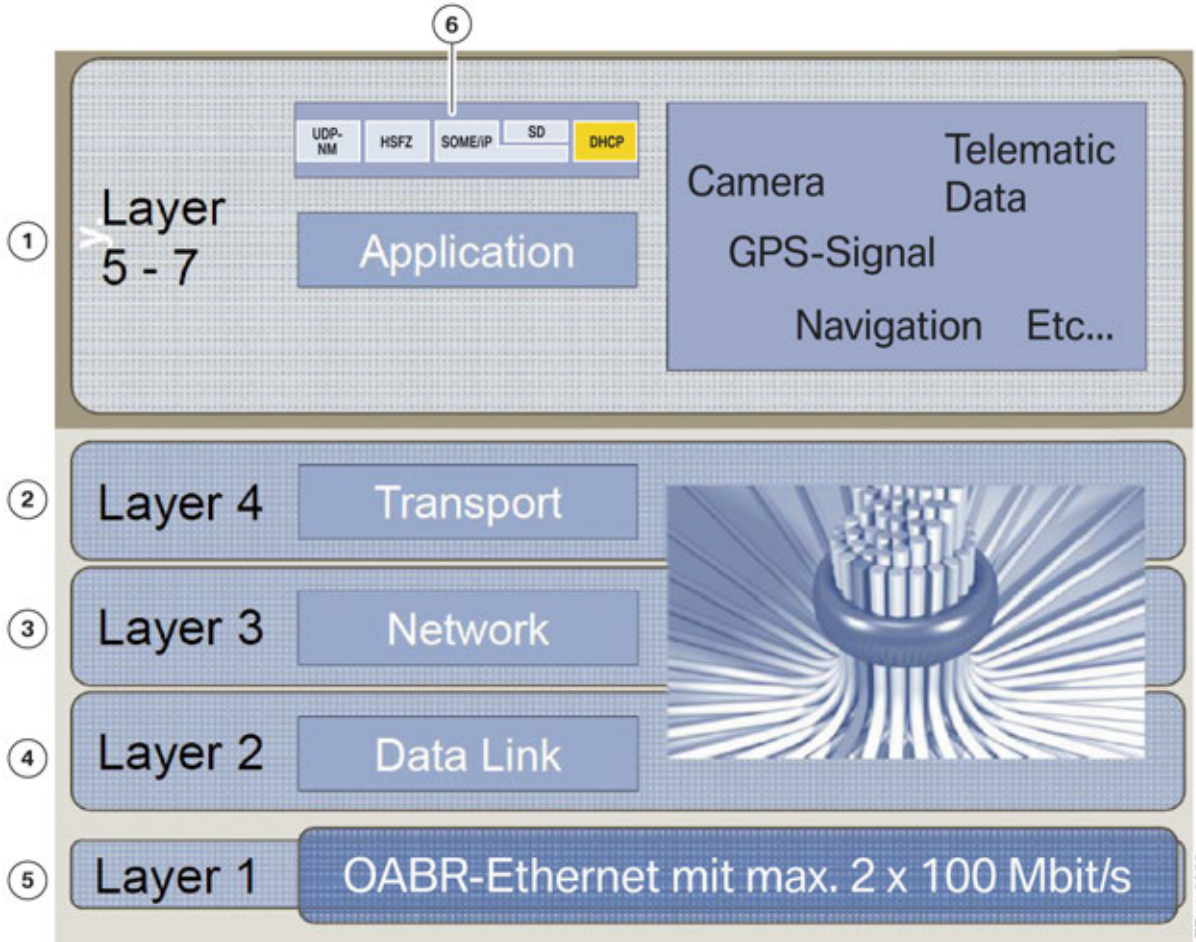
For the 2-wire Ethernet OABR, the following modules were also added:

- Vehicle network management
- Service discovery report (for the asynchronous starting and stopping of functions)

G12 Voltage Supply and Bus Systems

1. Bus Systems

The OSI model for the 2-wire OABR Ethernet looks as follows:



OSI model

Index	Explanation
1	Applications (user applications and processes)
2	Transport (package security, encryption)
3	Network (package delivery, routing)
4	Link = connection setup, interface (device driver, hardware)
5	Physical layer for data transfer with 2x100 MBit/s
6	Additional modules defined for the OABR Ethernet

G12 Voltage Supply and Bus Systems

1. Bus Systems

Application of 2-wire OABR Ethernet in the G12

The following control units are connected to the vehicle electrical system via 2-wire OABR Ethernet in the G12:

- Active Cruise Control (ACC)
- Camera-based driver assistance systems (KAFAS)
- Top Rear Side View Camera (TRSVC)

The following control units are also connected to the vehicle electrical system via 2-wire OABR Ethernet in the G12:

- Headunit (HEADUNIT)
- Rear Seat Entertainment (RSE)
- Optional equipment system (SAS)
- Telematic Communication Box (TCB)
- Top Rear Side View Camera (TRSVC)

1.2.5. D-CAN

The D-CAN has a data transfer rate of 500 kBit/s.

1.3. Sub-bus systems

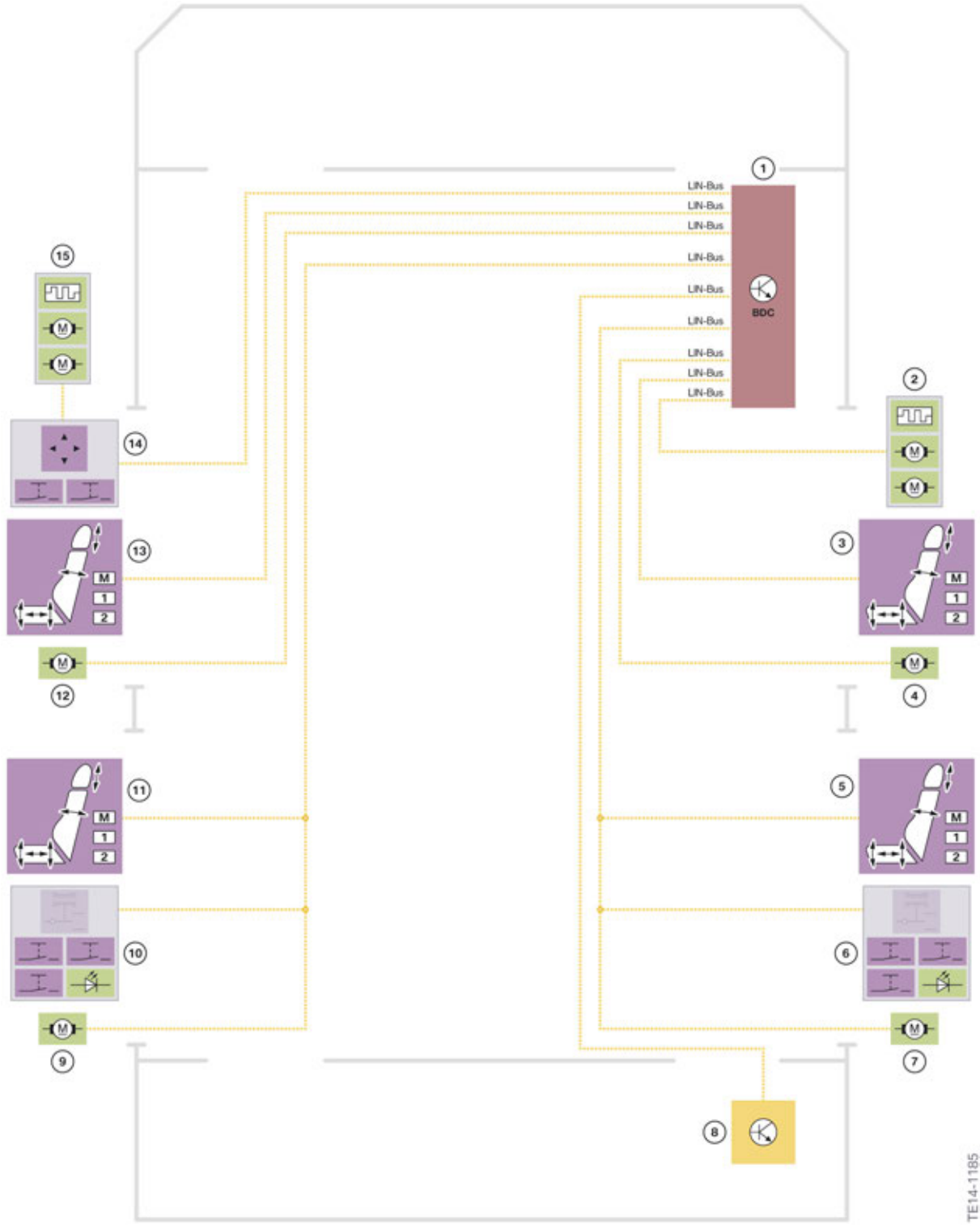
1.3.1. LIN-Bus

For a better overview, the LIN buses are divided up between several wiring diagrams for the G12.

G12 Voltage Supply and Bus Systems

1. Bus Systems

LIN bus overview in the door area



LIN-Bus

G12 Voltage Supply and Bus Systems

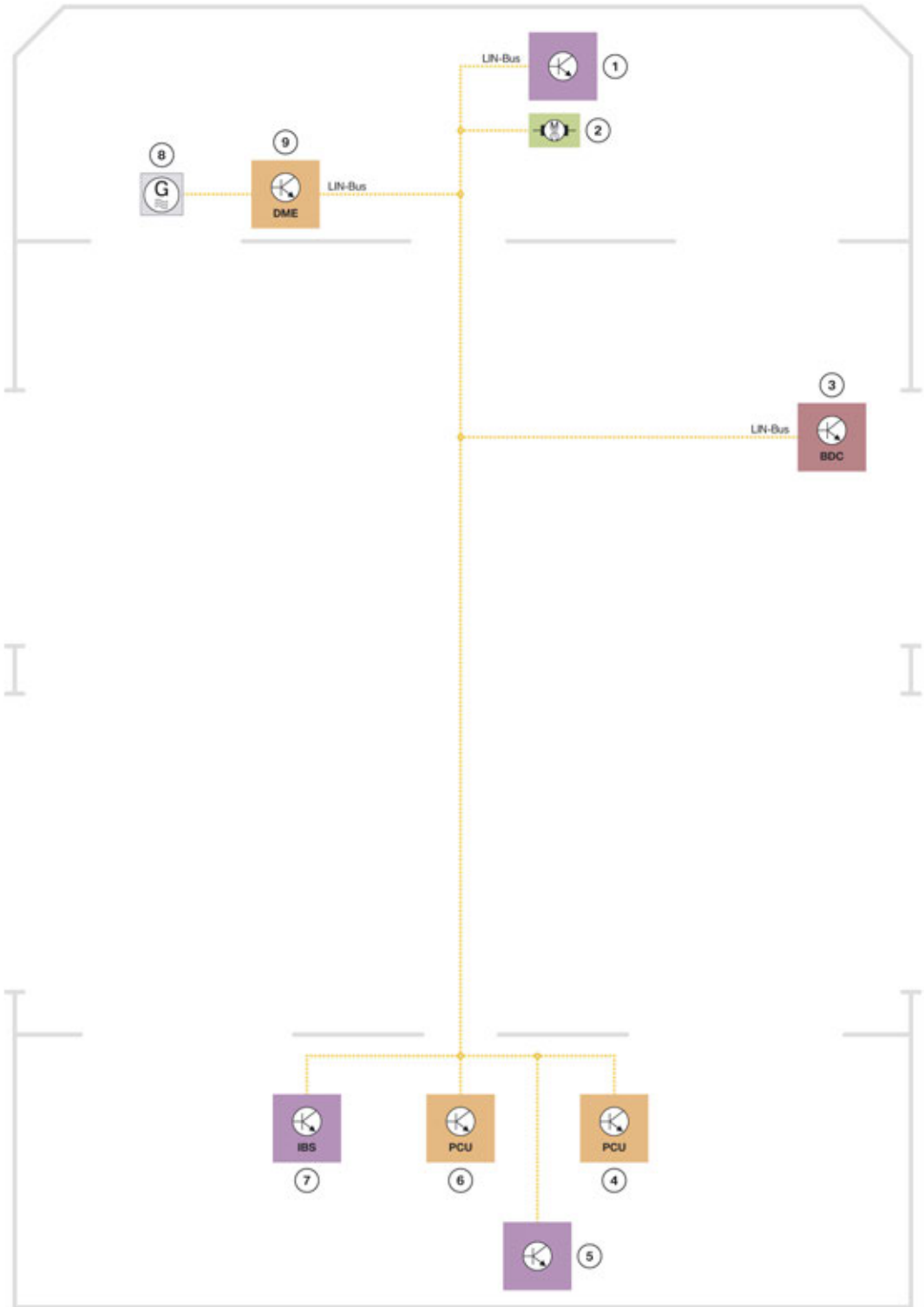
1. Bus Systems

Index	Explanation
1	Body Domain Controller (BDC)
2	Exterior mirror, front passenger side
3	Memory seat, front passenger's side
4	Power window electronics, passenger's side front
5	Memory seat, passenger's side rear
6	Switch for roller sunblind
7	Power window electronics, passenger’s side rear
8	Non-contact tailgate opening
9	Power window electronics, driver’s side rear
10	Switch for roller sunblind
11	Memory switch, driver’s side rear
12	Power window electronics, driver's side front
13	Memory switch, driver’s side front
14	Switch block, driver's door
15	Exterior mirror, driver's side

G12 Voltage Supply and Bus Systems

1. Bus Systems

LIN bus overview for engine electrical system and voltage supply



LIN-Bus

G12 Voltage Supply and Bus Systems

1. Bus Systems

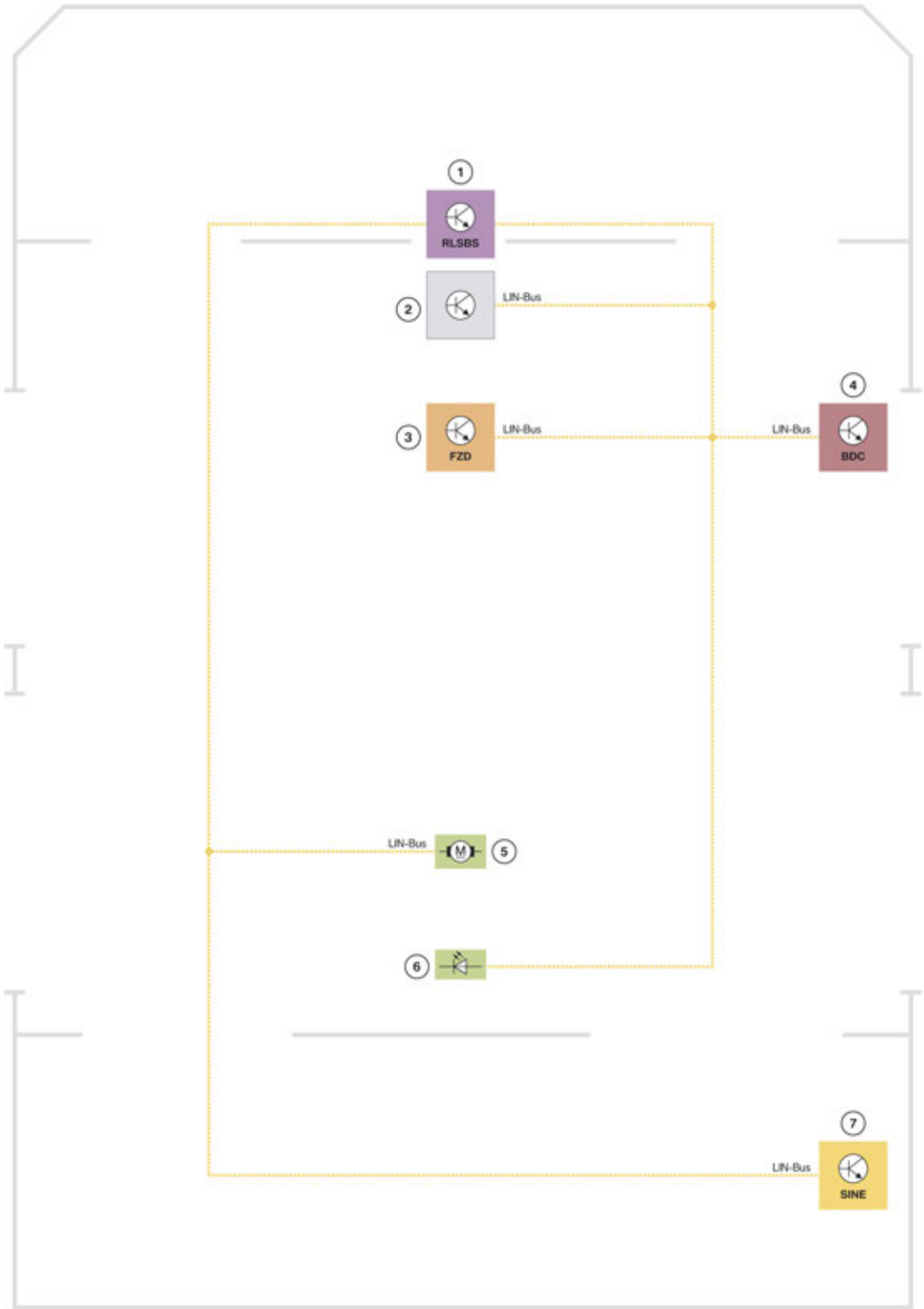
Index	Explanation
1	Air damper control
2	Electric fan
3	Body Domain Controller (BDC)
4	Power Control Unit (PCU) 500W
5	Rear right power distribution box
6	Power Control Unit (PCU) 150 W [1]
7	Intelligent battery sensor (IBS)
8	Alternator
9	Digital Motor Electronics (DME)

[1] The Power Control Unit (PCU) 150 W is installed in vehicles with 24 V steering.

G12 Voltage Supply and Bus Systems

1. Bus Systems

LIN bus overview for roof function center



LIN-Bus

G12 Voltage Supply and Bus Systems

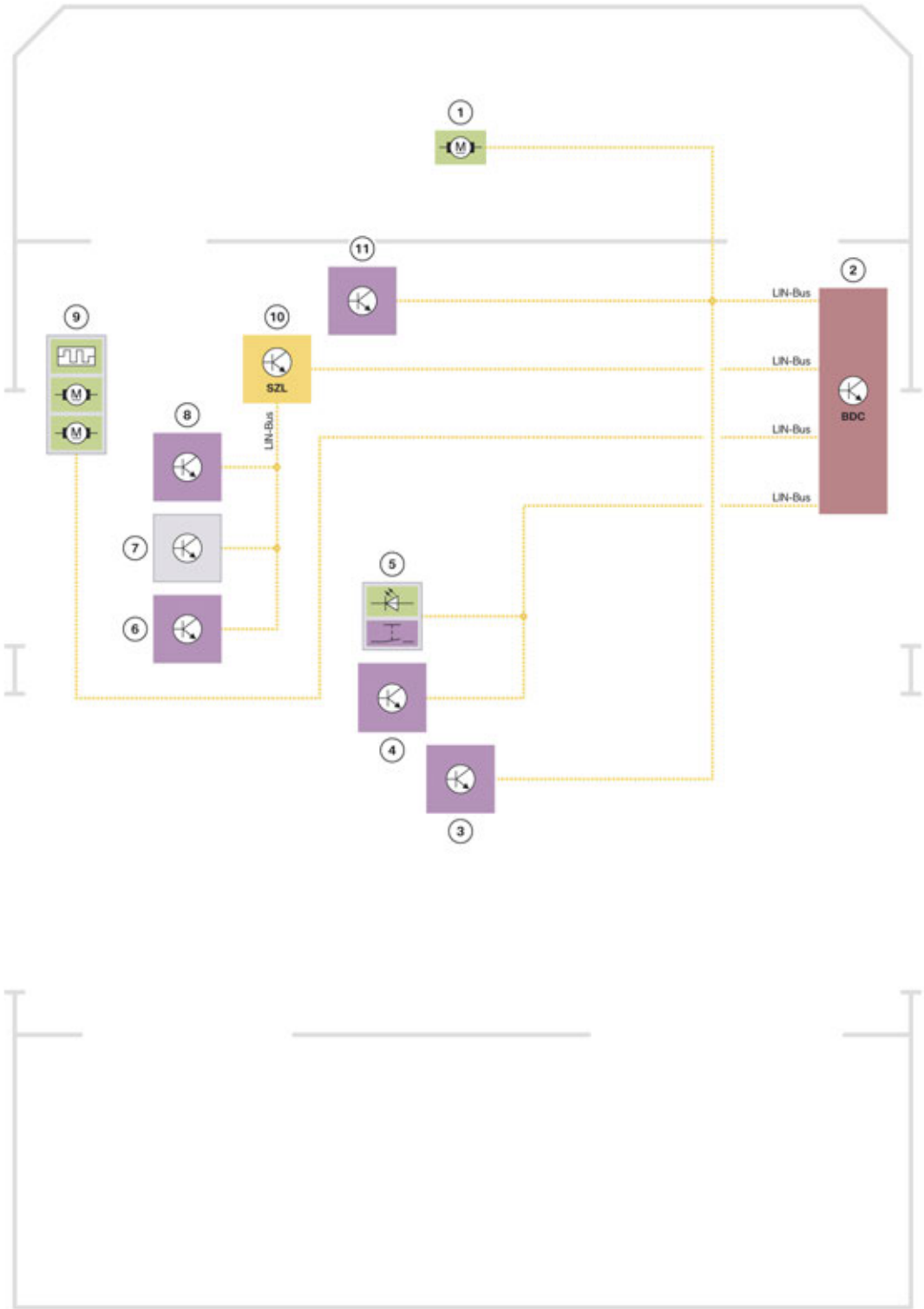
1. Bus Systems

Index	Explanation
1	Rain-light-solar-condensation sensor
2	Inside mirror
3	Roof function center (FZD)
4	Body Domain Controller (BDC)
5	Sliding roofliner motor
6	Interior lighting, rear
7	Siren with tilt alarm sensor SINE

G12 Voltage Supply and Bus Systems

1. Bus Systems

LIN bus overview for steering column switch cluster and operating units



LIN-Bus

G12 Voltage Supply and Bus Systems

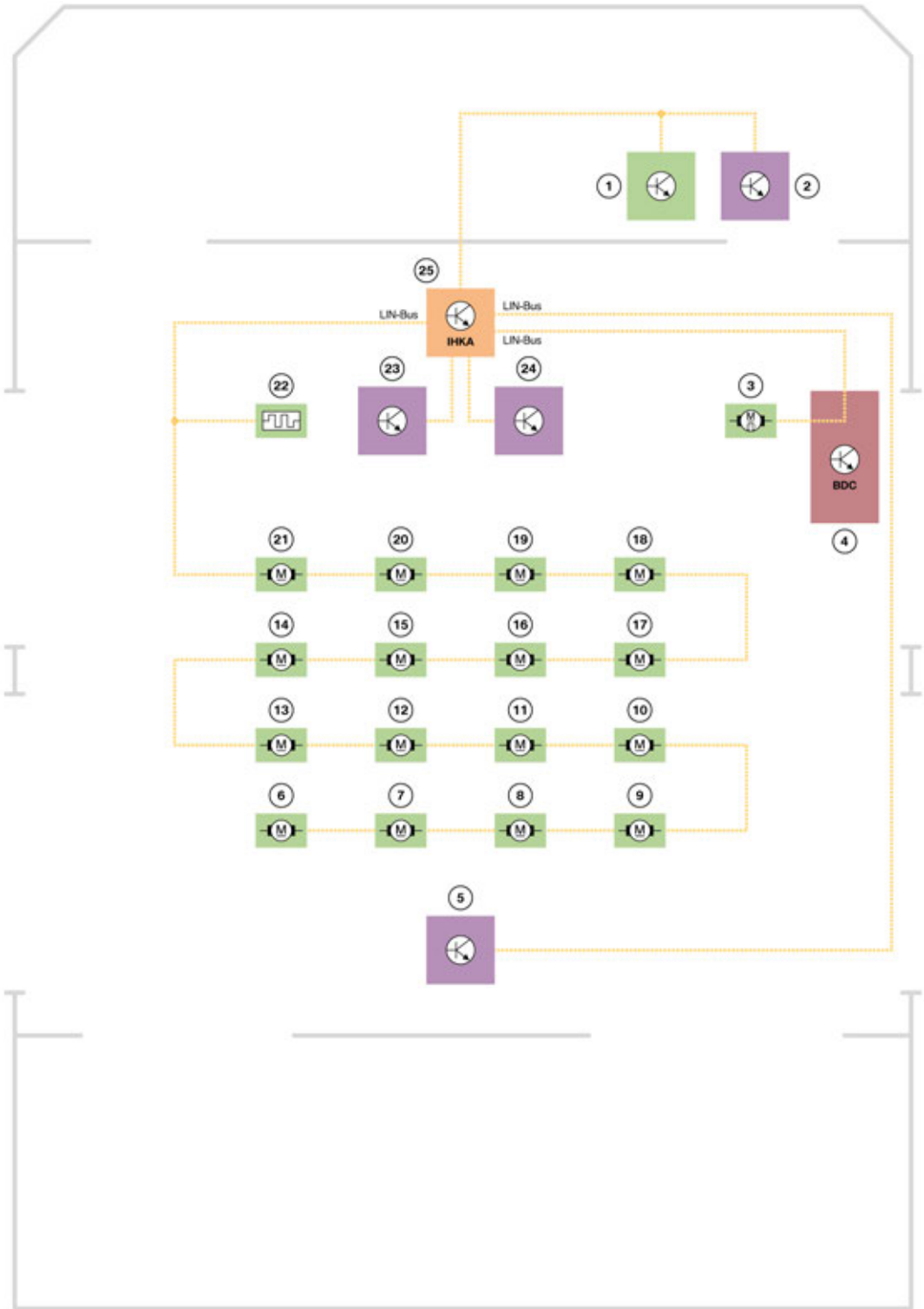
1. Bus Systems

Index	Explanation
1	Wiper motor
2	Body Domain Controller (BDC)
3	Operating unit, center console
4	Audio operating facility
5	Hazard warning switch/Intelligent Safety button
6	Touch detection HOD (Hands Off Detection)
7	Steering wheel module
8	Multifunction steering wheel buttons, right
9	Operating unit for light
10	Steering column switch cluster (SZL)
11	Steering column adjustment

G12 Voltage Supply and Bus Systems

1. Bus Systems

LIN bus overview for integrated automatic heating/air conditioning system



LIN-Bus

G12 Voltage Supply and Bus Systems

1. Bus Systems

Index	Explanation
1	Air freshener
2	Ozone generator
3	Blower motor
4	Body Domain Controller (BDC)
5	Operating unit, rear passenger compartment
6	Stepper motor, indirect ventilation
7	Stepper motor for blending flap, right rear passenger compartment
8	Stepper motor for blending flap, left rear passenger compartment
9	Stepper motor for blending flap, right
10	Stepper motor for blending flap, left
11	Stepper motor for air distribution, right rear passenger compartment
12	Stepper motor for air distribution, left rear passenger compartment
13	Stepper motor for footwell, right
14	Stepper motor for footwell, left
15	Stepper motor for stratification, right
16	Stepper motor for stratification, left
17	Stepper motor for ventilation, right
18	Stepper motor for ventilation, left
19	Stepper motor for defrost function
20	Stepper motor for air recirculation function
21	Stepper motor for fresh air
22	Electric auxiliary heater (Not for US)
23	Operating unit, air conditioning
24	Touch operating unit in the center grill
25	Integrated automatic heating / air conditioning (IHKA)

G12 Voltage Supply and Bus Systems

1. Bus Systems

1.3.2. Local CAN

The following local CAN buses are present in the G12 with corresponding equipment:

- Local CAN from electronic transmission control (EGS) to the gear selector switch (GWS)
- Local CAN from the camera-based driver assistance system (KAFAS) to the Parking Manoeuvre Assist (PMA)
- Local CAN from the optional equipment system (SAS) to the radar sensor right (RSR)
- Local CAN from the optional equipment system (SAS) to the radar sensor left (RSL) and blind spot detection (secondary) (SWW2)
- Local CAN from the blind spot detection (primary) (SWW) to the radar sensor right (RSR), to the radar sensor left (RSL) and blind spot detection (secondary) (SWW2)

The control units on the local CAN are not displayed in the bus overview by the BMW diagnosis system ISTA. Diagnosis takes place via the corresponding primary control unit.

The local CAN buses have a data transfer rate of 500 kBit/s.

1.3.3. USB

The following USB interfaces are provided in the G12 depending on the vehicle equipment:

- USB interface in the center console (standard)
- USB interface in the center armrest
- USB interface in the base plate
- USB interface in Rear Seat Entertainment

1.4. Diagnosis access OBD2

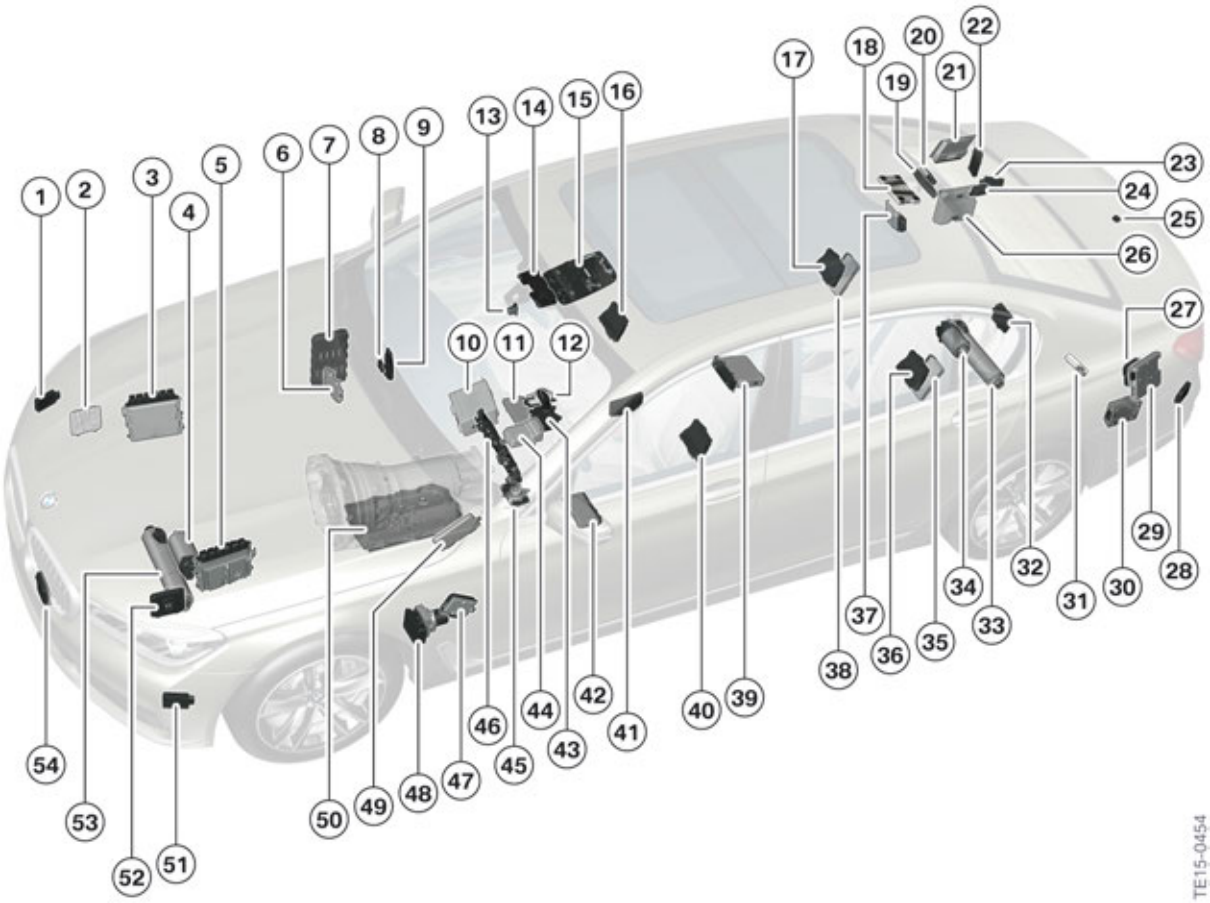
The vehicle diagnosis via D-CAN is effected using the OBD2 interface. The Ethernet access for the vehicle programming is also located in the OBD2 interface.

G12 Voltage Supply and Bus Systems

2. Control Units

2.1. Installation locations of control units

To provide a better overview, the control units are shown in two photos with different perspectives. All control units are shown in both pictures.



Installation locations of control units

Index	Explanation
1	Radar Sensor Right (RSR)
2	Front Light Electronics Right (FLER)
3	Digital Motor Electronics (DME)
4	Electronic Power Steering (EPS)
5	Digital Engine Electronics 2 (DME2)
6	Night Vision Electronics (NVE)
7	Body Domain Controller (BDC)
8	Near Field Communication (NFC)
9	Integrated automatic heating / air conditioning (IHKA)
10	Headunit (HU-H2)

G12 Voltage Supply and Bus Systems

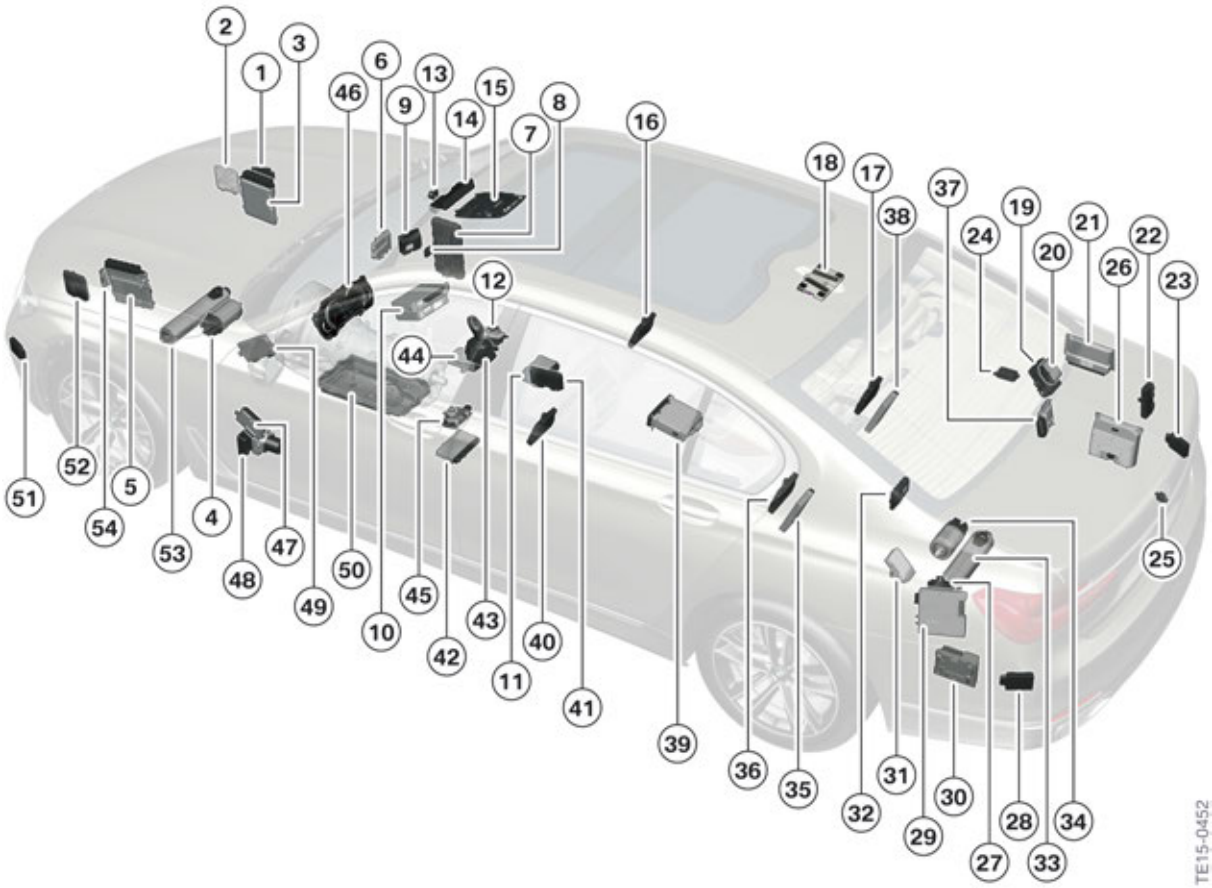
2. Control Units

Index	Explanation
11	Front passenger seat module (SMBF)
12	Controller (CON)
13	High-beam assistant (FLA)
14	Camera-based driver support systems (KAFAS)
15	Roof function center (FZD)
16	Seat pneumatics module front right (SPNMVR)
17	Seat pneumatics module back right (SPNMHR)
18	Telematic Communication Box (TCB)
19	Trailer module AHM — Not for US
20	Parking Manoeuvre Assist (PMA)
21	Vertical Dynamics Platform (VDP)
22	Tailgate function module (HKFM)
23	Blind spot detection (SWW)
24	Remote control service (FBD)
25	Rear view camera (RFK)
26	Power Control Unit (PCU)
27	Light Effect Manager (LEM)
28	Blind spot detection (secondary) (SWW2)
29	Video module (VM) — Not for US
30	Top Hi-Fi amplifier (AMPT)
31	Active Sound Design (ASD)
32	Rear climate control (Not for US)
33	Electric Active Roll Stabilization rear (EARSH)
34	Rear axle slip angle control (HSR)
35	Seat module, driver, rear (SMFH)
36	Seat pneumatics module back left (SPNMHL)
37	Selective Catalytic Reduction (SCR) — Not for US
38	Front passenger seat module, rear (SMBFH)
39	Rear Seat Entertainment (RSE)
40	Seat pneumatics module front left (SPNMVL)
41	Wireless charging tray (WCA)
42	Driver's seat module (SMFA)
43	Gear selector switch (GWS)
44	Advanced Crash Safety Module (ACSM)
45	Transfer box

G12 Voltage Supply and Bus Systems

2. Control Units

Index	Explanation
46	Instrument panel (KOMBI)
47	Optional equipment system (SAS)
48	Dynamic Stability Control (DSC)
49	Control unit for Top Rear Side View Camera (TRSVC)
50	Electronic transmission control (EGS)
51	Radar Sensor Left (RSL)
52	Front Light Electronics Left (FLEL)
53	Electric Active Roll Stabilization front EARSV
54	Active Cruise Control (ACC)



Installation locations of control units

Index	Explanation
1	Radar Sensor Right (RSR)
2	Front Light Electronics Right (FLER)
3	Digital Motor Electronics (DME)
4	Electronic Power Steering (EPS)

G12 Voltage Supply and Bus Systems

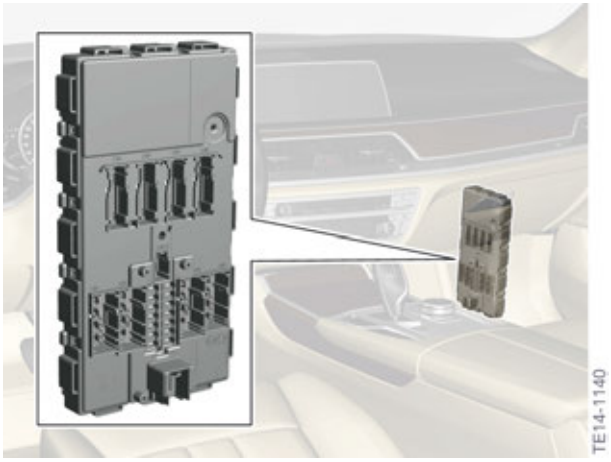
2. Control Units

Index	Explanation
5	Digital Engine Electronics 2 (DME2)
6	Night Vision Electronics (NVE)
7	Body Domain Controller (BDC)
8	Near Field Communication (NFC)
9	Integrated automatic heating / air conditioning (IHKA)
10	Headunit (HU-H2)
11	Front passenger seat module, (SMBF)
12	Controller (CON)
13	High-beam assistant (FLA)
14	Camera-based driver support systems (KAFAS)
15	Roof function center (FZD)
16	Seat pneumatics module front right (SPNMVR)
17	Seat pneumatics module back right (SPNMHR)
18	Telematic Communication Box (TCB)
19	Trailer module (AHM) — Not for US
20	Parking manoeuvre assist (PMA)
21	Vertical Dynamics Platform (VDP)
22	Tailgate function module (HKFM)
23	Blind spot detection (SWW)
24	Remote control service (FBD)
25	Rear view camera (RFK)
26	Power Control Unit (PCU)
27	Light Effect Manager (LEM)
28	Blind spot detection (secondary) (SWW2)
29	Video module (VM) — Not for US
30	Top Hi-Fi amplifier (AMPT)
31	Active Sound Design (ASD)
32	Rear climate control (Not for US)
33	Electric Active Roll Stabilization Rear (EARSH)
34	Rear axle slip angle control (HSR)
35	Seat module, driver, rear (SMFH)
36	Seat pneumatics module back left (SPNMHL)
37	Selective Catalytic Reduction (SCR) — Not for US
38	Front passenger seat module, rear (SMBFH)
39	Rear Seat Entertainment (RSE)

Index	Explanation
40	Seat pneumatics module front left (SPNMVL)
41	Wireless charging tray (WCA)
42	Driver's seat module (SMFA)
43	Gear selector switch (GWS)
44	Advanced Crash Safety Module (ACSM)
45	Transfer box
46	Instrument panel (KOMBI)
47	Optional equipment system (SAS)
48	Dynamic Stability Control (DSC)
49	Control unit for Top Rear Side View Camera (TRSVC)
50	Electronic transmission control (EGS)
51	Radar Sensor Left (RSL)
52	Front Light Electronics Left (FLEL)
53	Electric Active Roll Stabilization front EARSV
54	Active Cruise Control (ACC)

2.2. Gateway

2.2.1. Body Domain Controller (BDC)



Body Domain Controller (BDC)

G12 Voltage Supply and Bus Systems
2. Control Units

BDC functions

The Body Domain Controller BDC is responsible for the following functions:

- Gateway
- Electronic immobilizer
- Terminal control
- Central locking system
- Exterior lights
- Power windows
- Horn
- Interior light
- Wiper and windshield washer system
- Vehicle data storage
- Data transfer for Condition Based Service (CBS)

Fuses in the BDC

The following components are protected by fuses in the BDC:

- Audio operating facility
- Operating facility for assist systems
- Operating unit for light
- Power windows
- Heated rear window
- Tailgate function module
- Integrated automatic heating / air conditioning
- OBD2 interface
- Power Control Unit
- Rain-light-solar-condensation sensor
- Steering column switch cluster
- Telematic Communication Box
- Outside door handle electronics
- Vertical dynamics platform (electronics)
- Central locking system

G12 Voltage Supply and Bus Systems
2. Control Units

Relay in the BDC

The following relays are located in the BDC:

- Terminal 30F
- Power window regulators
- Central locking system
- Heated rear window
- Headlight cleaning system

Gateway in the BDC

The central gateway module (ZGM) is integrated in the BDC. It is viewed as a control unit within a control unit, in that the ZGM in the BDC behaves like an standalone control unit. The task of the ZGM is to connect all the data bus systems to each other. By connecting them in this way, it is possible to have and use information from the individual bus systems all in one location. The central gateway module is able to implement different protocols and speeds on other bus systems. The programming data for the control units are transmitted by Ethernet to the vehicle via the ZGM.

LIN controller in the BDC

The BDC is the gateway for the following components at the local interconnect network bus:

- Exterior mirrors left and right
- Switch block, driver's door, front passenger door
- Switch block, rear doors left and right
- Switch block, roller sunblind, rear doors left and right
- Steering column switch cluster
- Light switch
- Intelligent Safety button
- Audio operating facility
- Inside mirror
- Rain-light-solar-condensation sensor
- Roof function center (interior lighting)
- Comfort seat, rear passenger compartment, left and right
- Steering column adjustment
- Wiper
- Operating unit, center console
- Power distribution box, rear

G12 Voltage Supply and Bus Systems
2. Control Units

The following control units are connected to the BDC via LIN, but the BDC has only a wake-up function and not a gateway or master function:

- Battery charging unit
- Intelligent battery sensor
- Electric fan
- Active air-flap control
- Digital Motor Electronics

2.3. Control units on the MOST bus

2.3.1. Head unit

Head unit

In addition to operation via the controller, the head unit can now be operated by touch via the CID in the G12. In the case of optional equipment gesture control, select functions can also be operated by means of gestures.

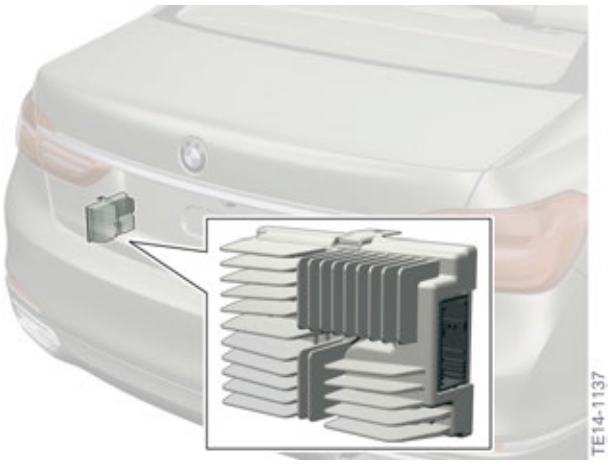
2.3.2. Hi-fi amplifier with MOST bus

The following amplifiers are used in the G12 corresponding to the audio systems:

- 7-channel amplifier without bus connection for Hi-Fi audio system
- 9-channel amplifier for Top Hi-Fi audio system
- 10-channel amplifier for High End audio system

Hi-Fi amplifier

7-channel amplifier without bus connection.



Hi-Fi amplifier

Top Hi-Fi amplifier

9-channel amplifier with MOST bus.

Top Hi-Fi amplifier

High End amplifier

10-channel amplifier with MOST bus.

High End amplifier

2.3.3. Rear seat entertainment (RSE)

Rear Seat Entertainment RSR

The Rear Seat Entertainment (RSE) in the G12 is equipped with a Blu-ray drive.

G12 Voltage Supply and Bus Systems
2. Control Units

2.4. Control units on the K-CAN2

2.4.1. Roof function center (FZD)

Roof function center (FZD)

Depending on the vehicle equipment the roof function center (FZD) includes the corresponding components for:

- Alarm system
- Control of the slide/tilt sunroof
- Gesture recognition camera

On vehicles with gesture control, the gesture recognition camera is installed in the FZD. The gesture recognition camera is not shown as a control unit by the BMW diagnosis system. Diagnosis takes place via the FZD. The gesture recognition camera is connected to the PT-CAN4. As a result, the bus signals do not have to be forwarded to another CAN bus by the Body Domain Controller.

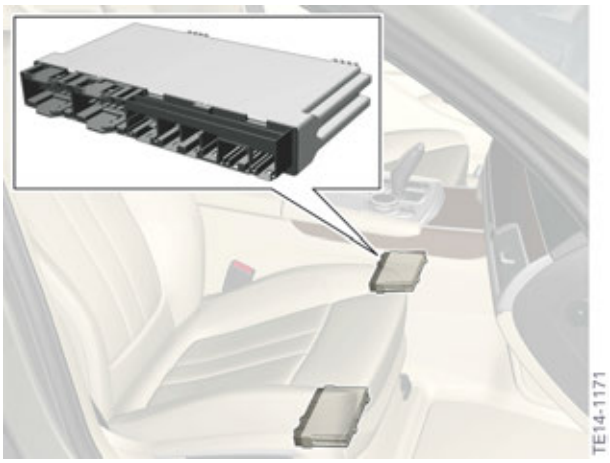
The FZD is not responsible for the control of the interior lighting. The interior light unit and the FZD electronics are located in the same housing.

2.4.2. Tailgate function module (HKFM)

Tailgate function module HKFM

The control unit for the tailgate function module is responsible for control of the tailgate lift.

2.4.3. Seat modules



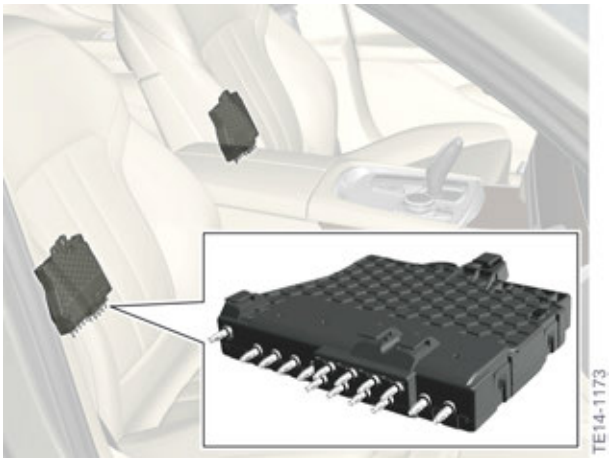
Seat module

The following seat modules are present corresponding to the vehicle equipment:

- Driver's seat module (SMFA)
- Front passenger seat module, (SMBF)
- Seat module, driver, rear (SMFH)
- Front passenger seat module, rear (SMBFH)

The seat modules are responsible for activation of the servomotors in the corresponding seat. Depending on the equipment, there may be 4 identical seat modules installed in the vehicle. Encoding of the control units takes place by connection to the wiring harness. The control unit is assigned correspondingly in the vehicle depending on the additional ground encoding.

2.4.4. Seat pneumatics modules



Seat pneumatics module back right SPNMHR

The following seat pneumatics modules are present corresponding to the vehicle equipment:

- Seat pneumatics module front left (SPNMVL)
- Seat pneumatics module front right (SPNMVR)
- Seat pneumatics module back left (SPNMHL)
- Seat pneumatics module back right (SPNMHR)

The seat pneumatics modules are responsible for the massage function in the corresponding seat. Depending on the equipment, there may be 2 or 4 identical seat pneumatics modules installed in the vehicle. Encoding of the control units takes place by connection to the wiring harness. The control unit is assigned correspondingly in the vehicle depending on the additional ground encoding.

2.5. Control units on the K-CAN3

2.5.1. Front Light Electronics

Front Light Electronics Right and Left

The control units Front Light Electronics Right (FLER) and Front Light Electronics Left (FLEL) are installed in the corresponding headlight.

The Front Light Electronics includes:

- LED activation in the corresponding headlight
- Activation of the stepper motor for the headlight beam throw adjustment

2.5.2. Rear view camera (RFK)

For the series introduction of the G12, a rear view camera on the K-CAN3 will be used. Changeover to Ethernet will take place at a later date.

2.5.3. Parking Manoeuvre Assist (PMA)

Parking manoeuvring assistant PMA

The PMA control unit performs the corresponding functions depending on equipment:

- Park Distance Control PDC (standard)
- Parking Manoeuvre Assist (SA5DP)

Park Distance Control (PDC) assists the driver when manoeuvring in and out of a parking space. The current distance from an obstruction is indicated by acoustic signals and on a visual display.

The Parking Manoeuvring Assistant makes it easier to park in parking spaces.

In a vehicle with Parking Manoeuvre Assist (PMA) all sensors of the Park Distance Control (PDC) are used. In addition, there is a sensor for the PMA in each case on the left and right of the front and rear bumper panels.

2.5.4. Blind spot detection (SWW)

blind spot detection SWW

Both control units for blind spot detection SWW (primary) and SWW2 (secondary) are shown in the picture. The SWW (primary) control unit is located on the right. The control unit SWW2 (secondary) is on the left.

The control unit for blind spot detection SWW is required for the following optional equipment:

- Driving Assistant Plus (Blind spot detection)
- Driving Assistant Plus II (Blind spot detection and Side collision warning)

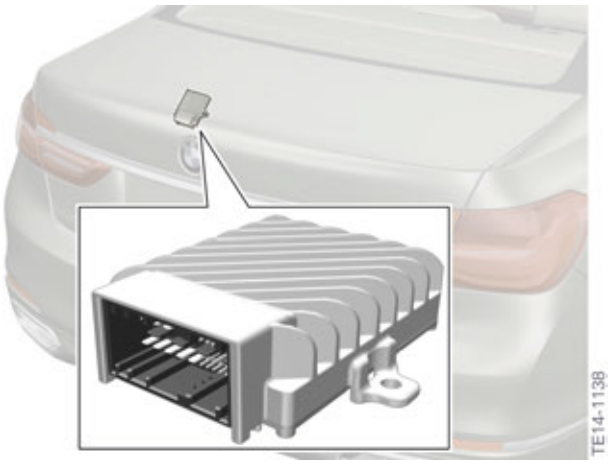
The SWW is the primary control unit which is also used for diagnosis of the additional control units connected to the local CAN buses.

The following additional control units are required for the optional equipment Driving Assistant Plus:

- Radar Sensor Left
- Radar Sensor Right

2.6. Control units on the K-CAN4

2.6.1. Active Sound Design (ASD)



Active Sound Design ASD

The control unit for Active Sound Design generates the engine sound for the vehicle interior. The engine sound is calculated according to the programmed sound specification and various parameters such as the accelerator pedal angle (driver's desired load), engine speed and torque. It is then output via the vehicle's own audio system in the passenger compartment.

2.6.2. Controller (CON)

Controller CON

The controller with touchpad is used in the G12. In the touch control panel, the customer can input location information for the navigation system or telephone numbers and contact details. In the map operation the map section for example can be moved and enlarged or reduced by finger movement.

2.6.3. Integrated automatic heating / air conditioning (IHKA)

Integrated automatic heating / air conditioning (IHKA)

The integrated automatic heating/air conditioning system IHKA is standard equipment in the G12.

G12 Voltage Supply and Bus Systems
2. Control Units

2.6.4. Light Effect Manager (LEM)

Light Effect Manager (LEM)

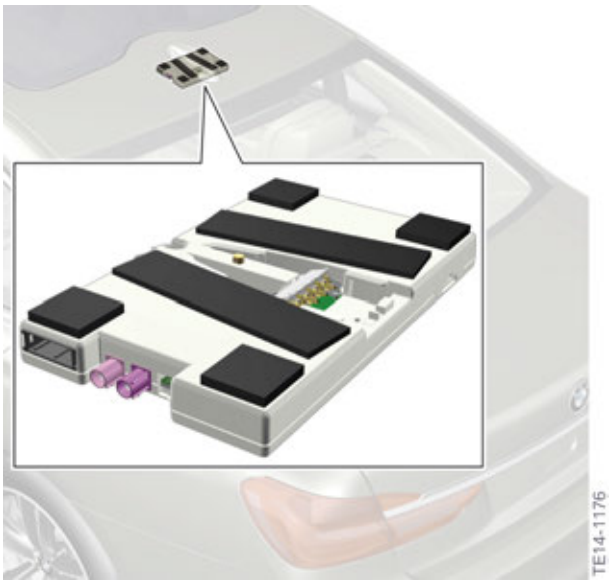
The control unit LEM is responsible for controlling the following lighting systems:

- Panorama glass roof
- Light Sabers on the B-pillars
- Speaker covers in the High End audio system

The LEM is also responsible for controlling the BMW Touch Command snap-in adaptor via LIN bus:

- Release and locking
- Lighting
- Charge conditions

2.6.5. Telematic Communication Box (TCB)



Telematic Communication Box (TCB)

The 2nd generation Telematic Communication Box (TCB2) is installed in the G12. The Telematic Communication Box (TCB2) is connected directly to the roof-mounted aerial and is responsible for the following functions:

- BMW Assist with eCall (emergency-call function)
- BMW Online
- BMW Internet using a SIM card integrated in the vehicle (P-SIM)
- Remote functions (reception and controller)
- "Speech-to-text" function in Office area
- BMW Tele Services via P-SIM

G12 Voltage Supply and Bus Systems
2. Control Units

2.7. Control units on the K-CAN5

2.7.1. Remote control receiver (FBD)

Remote control receiver

The control unit remote control receiver (FBD) is responsible for communication of the remote control services. It receives the data of the wheel electronics for the tire pressure control.

The control unit FBD is not shown in the bus overview by the BMW diagnosis system ISTA. Diagnosis is performed via the Body Domain Controller.

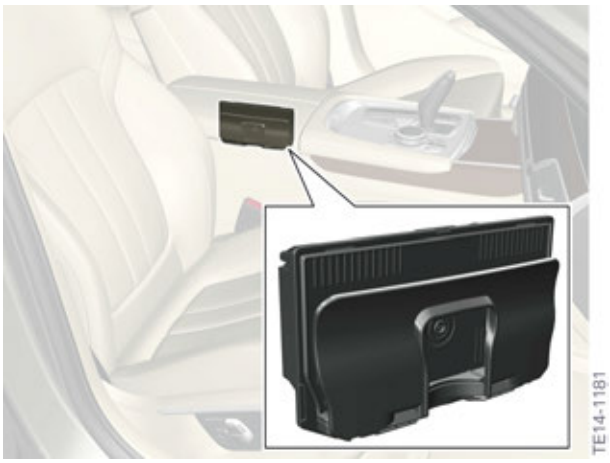
2.7.2. Near Field Communication NFC

Near Field Communication NFC

The control unit Near Field Communication (NFC) is required for Near Field Communication in the vehicle.

The control unit NFC is not shown in the bus overview by the BMW diagnosis system ISTA. Diagnosis is performed via the Body Domain Controller.

2.7.3. Wireless charging tray (WCA)



Wireless charging tray (WCA)

The control unit Wireless Charging Tray (WCA) monitors the charging tray and controls the charging procedure.

The control unit WCA is not shown in the bus overview by the BMW diagnosis system ISTA. Diagnosis is performed via the Body Domain Controller.

2.8. Control units on the Ethernet

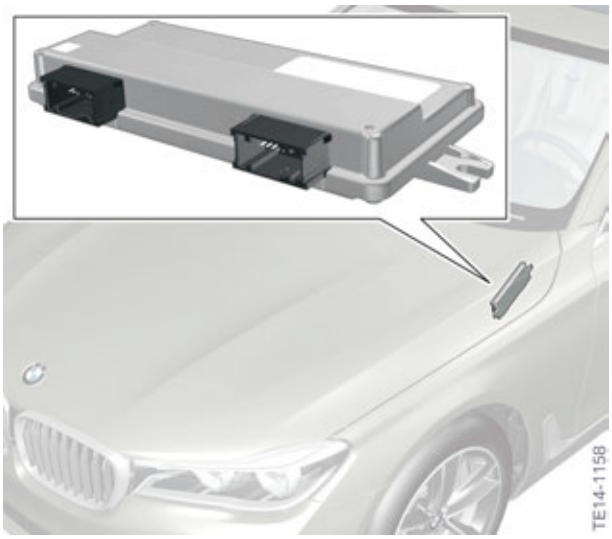
2.8.1. Active Cruise Control (ACC)

Active Cruise Control ACC

The control unit Active Cruise Control for ACC Stop&Go is a radar-based sensor for sensing the area in front of the vehicle. Both the near and far ranges are monitored by one sensor.

G12 Voltage Supply and Bus Systems
2. Control Units

2.8.2. Top Rear Side View Camera (TRSVC)



Top Rear Side View Camera (TRSVC)

The control unit Top Rear Side View Camera receives the picture information from the following cameras:

- Front camera
- Exterior mirror camera, left
- Exterior mirror camera, right
- Reversing camera

The cameras are connected to the TRSVC via Ethernet.

2.8.3. Camera-based driver support systems (KAFAS)

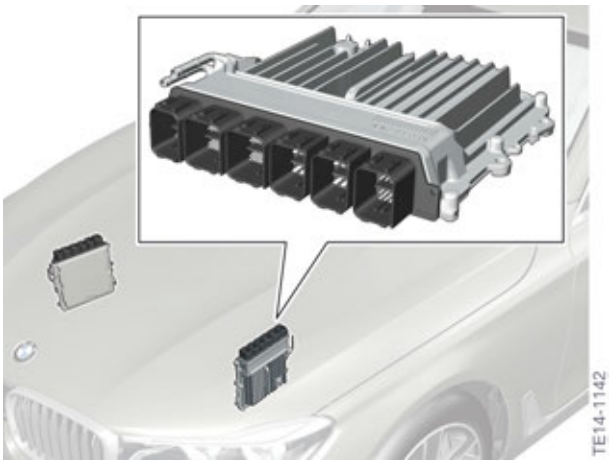
The control unit camera-based driver support systems (KAFAS) is required for the following optional equipment:

Camera-based driver support systems (KAFAS)

- Camera-based cruise control with Stop&Go function
- Traffic Jam Assist
- Road sign recognition
- Tailgate warning
- Person recognition with city braking function
- Collision warning with city braking function

2.9. Control units on the PT-CAN

2.9.1. Digital Motor Electronics DME, DME2



Digital Motor Electronics DME and DME2

The illustration shows the DME and DME2 control units. The DME2 control unit is on the left side (seen in the direction of travel).

G12 Voltage Supply and Bus Systems
2. Control Units

The DME is responsible for the control of the combustion engine. In addition, the DME is the gateway between PT-CAN and PT-CAN2.

The DME control unit is installed for 6-cylinder engines.

The DME2 is an additional control unit installed for 8-cylinder engines.

2.9.2. High-beam assistant (FLA)

High-beam assistant (FLA)

On vehicles without camera-based driver assistance systems KAFAS, the control unit for the high-beam assistant is integrated in the interior mirror. On vehicles with KAFAS, the function of the high-beam assistant is performed by the camera-based assistance system.

2.9.3. Instrument panel (KOMBI)

Instrument panel KOMBI

Only one instrument cluster version is used in the G12:

- Dynamic digital instrument cluster with 12.3" TFT display

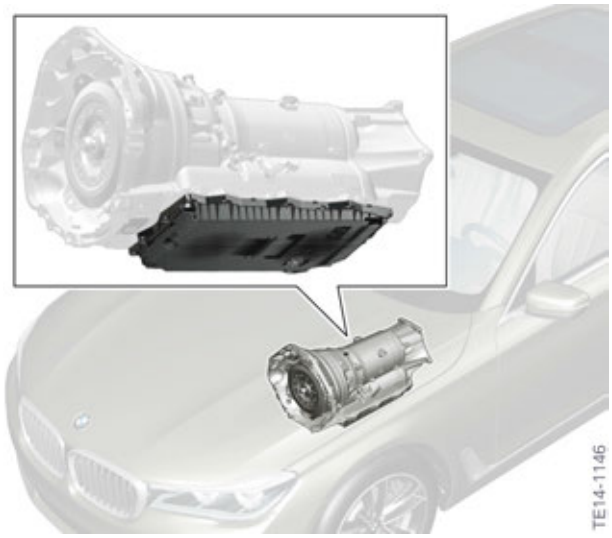
2.9.4. Night vision electronics NVE

Night vision electronics NVE

The control unit Night Vision Electronics receives picture information from the Night Vision camera. The picture information is transmitted via CVBS to the head unit and can be displayed in the CID if required.

2.10. Control units on the PT-CAN2

2.10.1. Electronic transmission control (EGS)



Electronic transmission control EGS

The control unit for electronic transmission control is installed directly in the automatic transmission.

2.10.2. Gear selector switch (GWS)

Gear selector switch GWS

The gear selector switch is used for selecting a drive position.

The bus connection is done via the PT-CAN2 and an additional local CAN to the electronic transmission control (EGS).

2.10.3. Power Control Unit (PCU)

PCU

The Power Control Unit is required:

- For charging the auxiliary battery
- For supplying the vehicle electrical system with the auxiliary battery

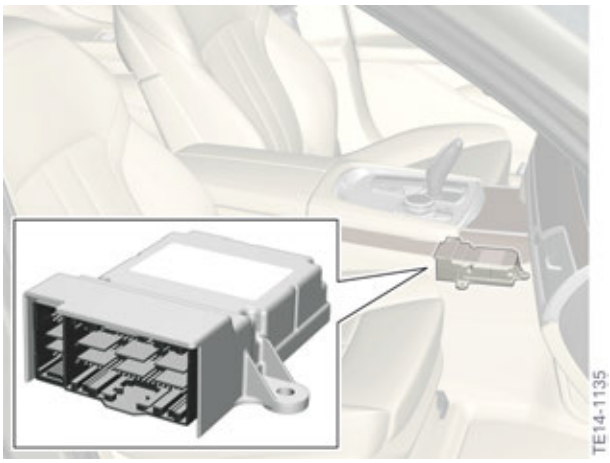
The Power Control Unit (PCU) contains a DC/DC converter with a power of 500 W.

G12 Voltage Supply and Bus Systems
2. Control Units

The preconditions for the direction of the energy management are calculated from the use of the vehicle. The auxiliary battery is charged by the PCU when the engine is running. During the phases in which the combustion engine is not running, e.g. automatic engine start-stop function, the PCU supplies energy from the auxiliary battery to the vehicle electrical system.

2.11. Control units on the FlexRay

2.11.1. Advanced Crash Safety Module (ACSM)



Crash Safety Module (ACSM)

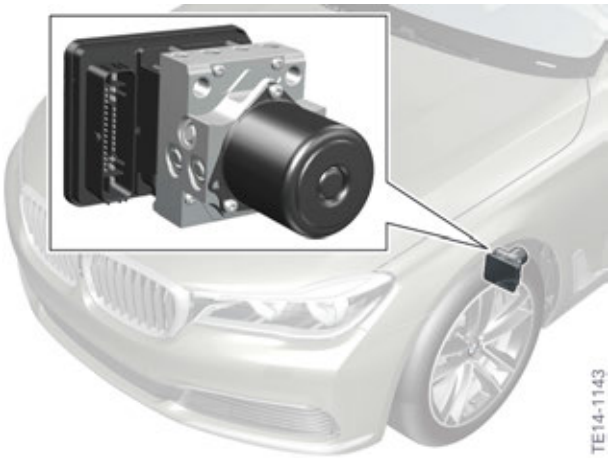
The function of the Advanced Crash Safety Module (ACSM) is to permanently evaluate all sensor signals in order to identify a crash situation. The ACSM evaluates the information from the sensors and then forwards corresponding measures for selective activation of the necessary restraint systems.

The ACSM records the yaw rate and sends this information on the FlexRay data bus.

No additional yaw sensors are therefore required for the other systems.

G12 Voltage Supply and Bus Systems
2. Control Units

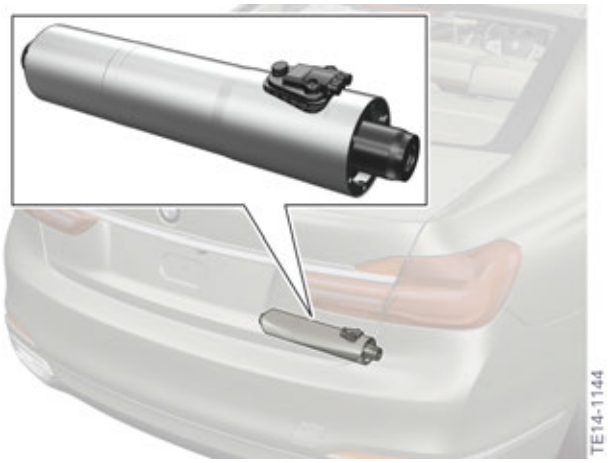
2.11.2. Dynamic Stability Control DSC



Dynamic Stability Control (DSC)

2.11.3. Electric Active Roll Stabilization

Electric Active Roll Stabilization front, EARSV



Electric Active Roll Stabilization rear, EARSH

The control units for Electric Active Roll Stabilization are installed directly in the corresponding actuator.

2.11.4. Electronic Power Steering (EPS)

Electronic Power Steering, EPS

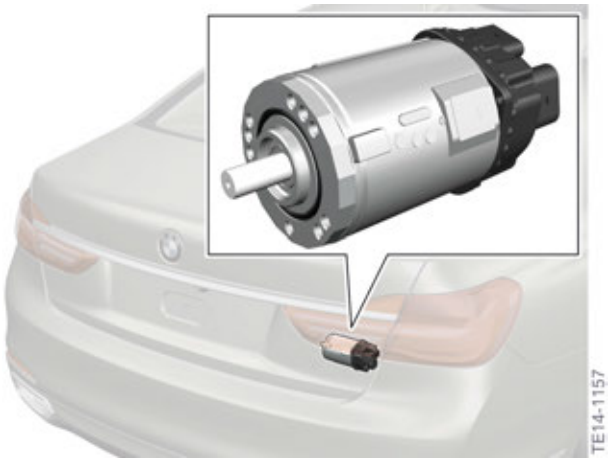
The Electronic Power Steering (electromechanical power steering) is supplied with a voltage of 12 V or 24 V depending on the equipment and engine type.

An auxiliary battery, a separating element and a charging unit for the auxiliary battery are required for the 24 V version. These components are installed in the luggage compartment of the G12.

The steering angle information is determined by the EPS and made available to the other control units via the FlexRay bus.

G12 Voltage Supply and Bus Systems
2. Control Units

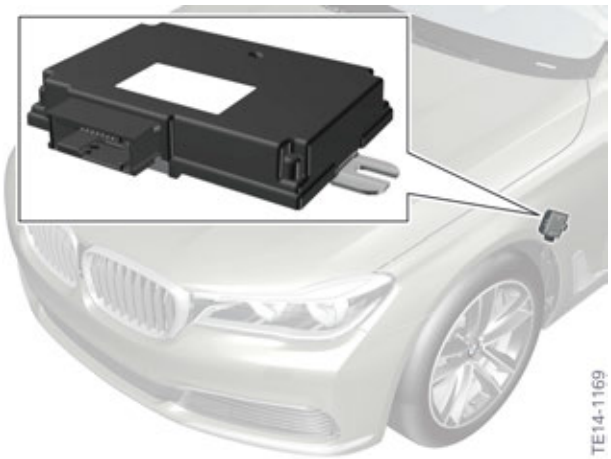
2.11.5. Rear axle slip angle control (HSR)



Rear axle slip angle control HSR

The control unit for slip angle control is responsible for steering the rear axle.

2.11.6. Optional equipment system (SAS)



Optional equipment system (SAS)

The optional equipment system control unit provides a variety of driver assistance functions. The SAS does not have any installed sensors. The information needed for the functions is made available by the corresponding control units and sensors. The SAS activates the control units necessary for the corresponding function.

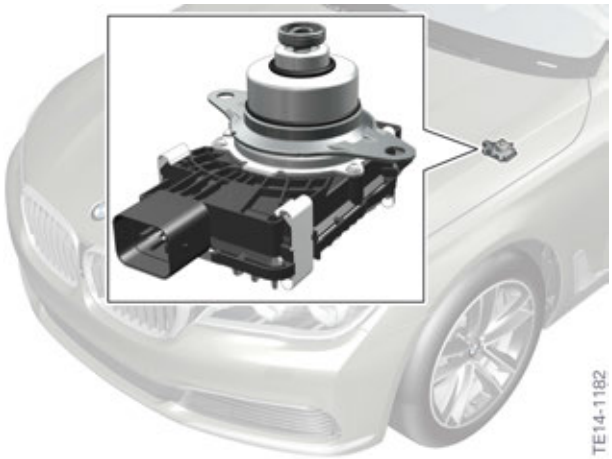
Possible functions:

- Collision warning with city braking function
- Cruise control with braking function
- Person recognition with city braking function
- Parking Manoeuvre Assist

- Traffic jam assist
- Camera-based cruise control with Stop&Go function
- Proactive driving assistant

The image information required by the optional equipment system is provided by the camera-based driver support systems.

2.11.7. Transfer box



Transfer box

The control unit for the transfer box controls the clutch in the transfer box on vehicles with xDrive.

2.11.8. Vertical Dynamics Platform (VDP)

Vertical Dynamics Platform VDP

G12 Voltage Supply and Bus Systems
2. Control Units

The control unit Vertical Dynamics Platform is required for the following equipment:

- Dynamic Damper Control
- Air Suspension

The VDP control unit tasks:

- Valve control in the shock absorbers
- Detection of vehicle ride heights by the ride height sensors
- Control of compressor and valves for the air suspension

2.12. Control units on the local CAN

The control units on the local CAN are not displayed in the bus overview by the BMW diagnosis system ISTA. Diagnosis takes place via the corresponding primary control unit.

2.12.1. Radar sensor

Radar Sensor Left RSL and Radar Sensor Right RSR

The control units Radar Sensor Right (RSR) and Radar Sensor Left (RSL) are installed at the front right and front left of the vehicle for the optional equipment Driver Assistance Plus II (Active Driving Assist Plus - SA5AT).

G12 Voltage Supply and Bus Systems
2. Control Units

2.12.2. Blind spot detection (SWW2) (secondary)

Blind spot detection

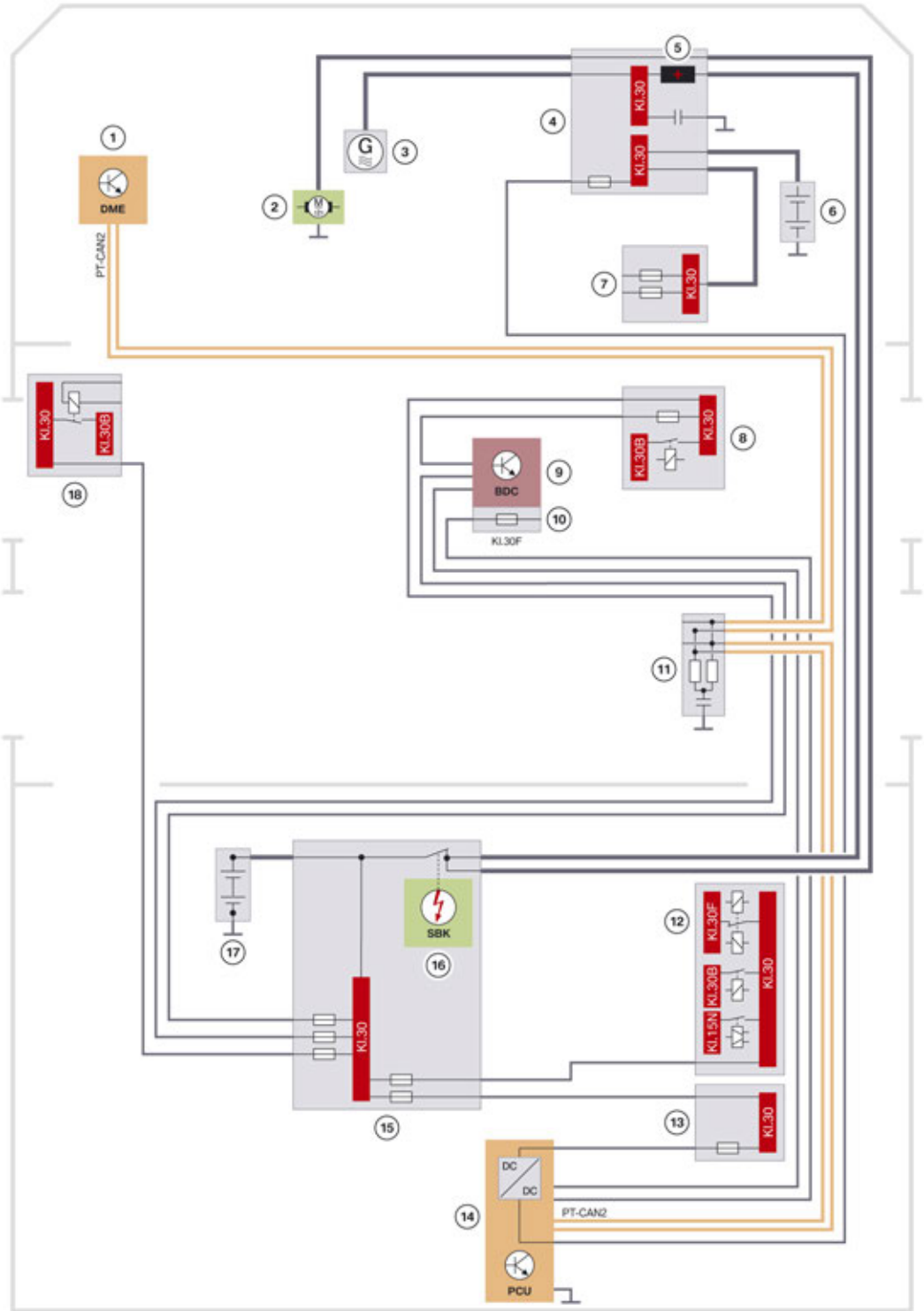
Both control units for blind spot detection SWW (primary) and SWW2 (secondary) are shown in the picture. The SWW (primary) control unit is located on the right and the SWW2 (secondary) is on the left. The two control units are connected with each other via a local CAN. Diagnose with the BMW diagnosis system takes place via the primary control unit.

G12 Voltage Supply and Bus Systems

3. Voltage Supply

3.1. Overview of voltage supply

3.1.1. System wiring diagram



G12 Voltage Supply and Bus Systems

3. Voltage Supply

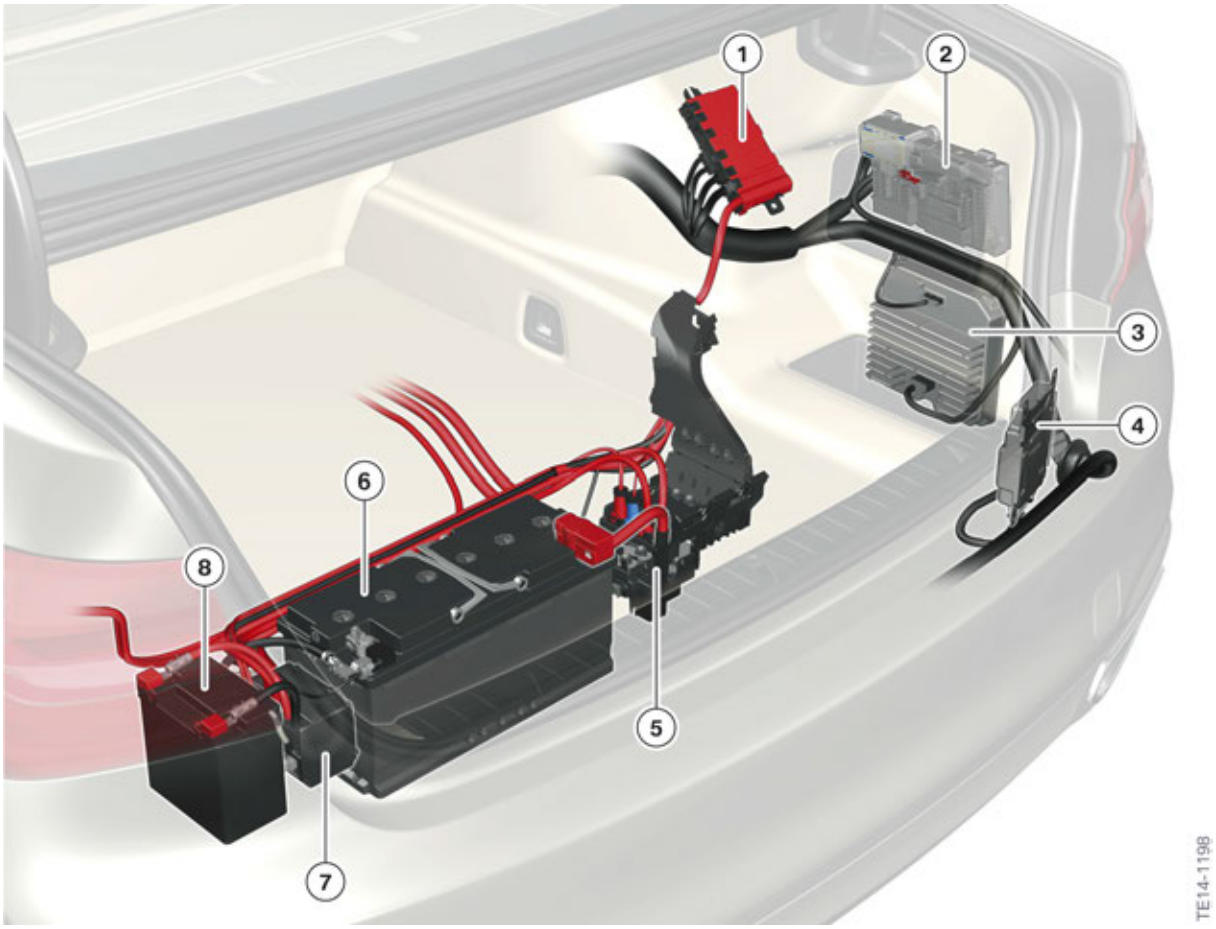
Index	Explanation
1	Digital Motor Electronics (DME)
2	Starter motor
3	Alternator
4	Power distribution box, engine compartment
5	Jump start terminal point
6	Auxiliary battery, engine compartment
7	Power distribution box, auxiliary battery, engine compartment
8	Power distribution box, front right
9	Body Domain Controller (BDC)
10	Fuse in the Body Domain Controller
11	CAN terminator
12	Power distribution box, rear
13	Fuse in the power distribution box, battery, right
14	Power Control Unit (PCU) 500 W
15	Battery power distribution box
16	Battery safety terminal
17	Battery
18	Power distribution box, front left

G12 Voltage Supply and Bus Systems

3. Voltage Supply

3.2. Components

3.2.1. Overview of luggage compartment



Battery

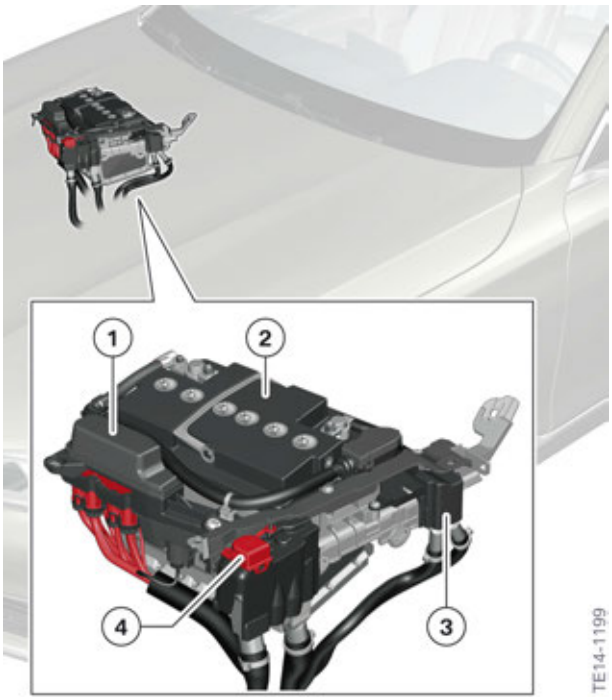
Index	Explanation
1	Power distribution box, battery, right
2	Power distribution box, rear
3	Power Control Unit (PCU) 500 W
4	Power Control Unit (PCU) 150 W
5	Power distribution box with Battery safety terminal
6	Battery
7	Separator
8	Auxiliary battery, luggage compartment

The vehicle battery in the G12 is a 105 Ah AGM battery.

G12 Voltage Supply and Bus Systems

3. Voltage Supply

3.2.2. Overview of engine compartment



Auxiliary battery, engine compartment

Index	Explanation
1	Power distribution box, engine compartment
2	Auxiliary battery, engine compartment
3	Power distribution box, auxiliary battery, engine compartment
4	Jump start terminal point

3.2.3. Battery

AGM batteries are used for the voltage supply in the G12.

There may by 1, 2 or 3 batteries in the vehicle depending on the engine version and vehicle equipment.

- Starter battery in the luggage compartment with 105 Ah
- Auxiliary battery in the engine compartment with 60 Ah
- Auxiliary battery in the luggage compartment with 12 Ah for vehicles with 24 V steering

An auxiliary battery in the engine compartment is used on vehicles with Electric Active Roll Stabilization, the two anti-roll bar actuators are supplied with power by this battery. Also, it provides assistance for the vehicle electrical system during engine off conditions (MSA).

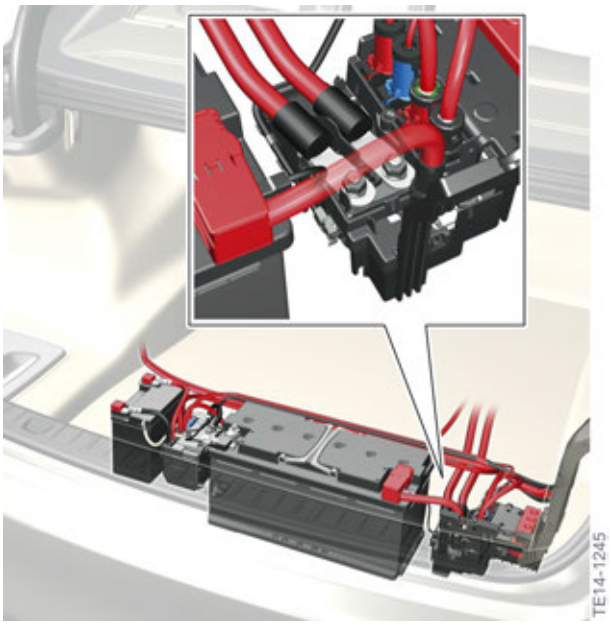
3.2.4. Intelligent battery sensor

The Intelligent Battery Sensor (IBS) records the following data of the 12 V battery:

- Voltage
- Current
- Pole temperature

The IBS performs the calculation and the evaluation of the information. The results are then forwarded to the superior control units via local interconnect network bus (DME and BDC).

3.2.5. Battery Safety Terminal



Battery safety terminal

The Battery Safety Terminal (BST) is activated in the event of an accident of corresponding severity. The voltage supply to the positive battery connection point in the engine compartment is interrupted and the consumers connected to this are de-energized. The Battery safety terminal is installed in the power distribution box next to the battery.

G12 Voltage Supply and Bus Systems
3. Voltage Supply

3.2.6. Alternator

Alternators with increased efficiency are used in the G12. The increase in alternator efficiency is achieved by reducing the losses in the rectifier. The loss-causing diodes are replaced by MOSFET transistors. A reduction in fuel consumption is achieved by increasing the efficiency.

Different alternators are used depending on the engine type and vehicle equipment.

Versions:

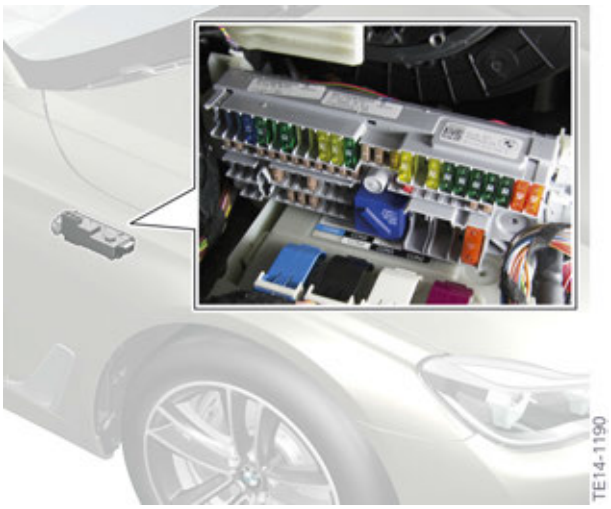
- Bosch with 180 A and 250 A for 6-cylinder engines
- Valeo with 252 A for 8-cylinder engines

3.2.7. Integrated supply module

Integrated supply module

The engine control and its components are supplied with a 12 V voltage via the integrated supply module.

3.2.8. Power distribution box, front right



Power distribution box, front right

A relay for terminal 30B is installed in the front right power distribution box.

Consumers are supplied with terminal 30, terminal 30B and terminal 15N and provided with corresponding fuse protection by the front right power distribution box. Terminal 15N is supplied from the front power distribution box by the rear power distribution box.

3.2.9. Power distribution box, front left

Power distribution box, front left

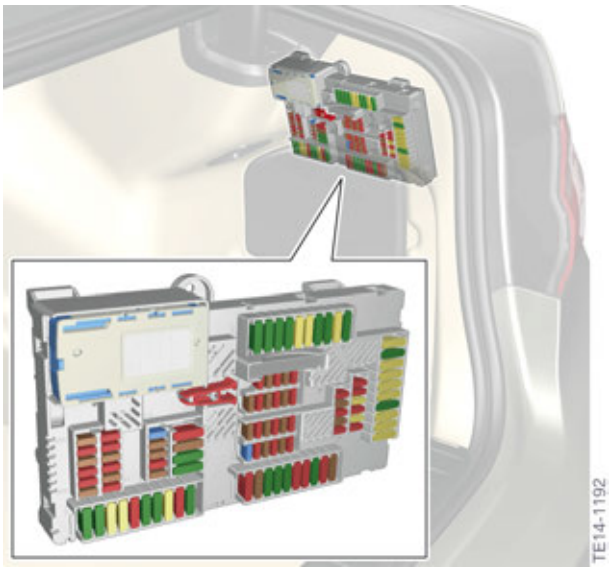
A relay for terminal 30B is installed in the front left power distribution box.

The front left power distribution box supplies consumers with terminal 30 and terminal 30B as well as corresponding fuse protection.

G12 Voltage Supply and Bus Systems

3. Voltage Supply

3.2.10. Power distribution box, rear



Power distribution box, rear

The following relays are installed in the rear power distribution box:

- 1 or 2 terminal 30F relays
- 2 terminal 30B relays
- 1 terminal 15N relay
- 1 relay for rear window heating

All relays are bi-stable relays. The relays area activated by the Body Domain Controller via LIN. The hard-wired terminal 30B relays of the two front power distribution boxes are activated via the rear power distribution box.

3.2.11. Body Domain Controller

The Body Domain Controller (BDC) is responsible for the terminal control.

A terminal 30F relay is installed in the BDC.

A number of consumers are supplied with terminal 30, terminal 30F, and provided with corresponding fuse protection via the BDC.

3.2.12. PCU with vehicle electrical system assistance measure

On vehicles with the equipment Electric Active Roll Stabilization, energy is supplied by the auxiliary battery in the engine compartment.

Modern vehicles have a high energy consumption due to the many electrical consumers. As a result, there is a high demand on the battery particularly in phases in which the combustion engine is not running and the alternator supplies no energy (e.g. engine start-stop phases).

In order to protect the battery, a DC/DC converter is installed in the Power Control Unit (PCU) and an auxiliary battery is installed in the engine compartment.

The preconditions for the direction of the energy management are calculated from the use of the vehicle. When the engine is running the auxiliary battery is charged from the conventional vehicle electrical system. During the phases in which the combustion engine is not running, e.g. automatic engine start-stop function, the conventional vehicle electrical system is supplied by the auxiliary battery.

The Power Control Unit (PCU) is connected to the PT-CAN2 and a DC/DC converter with a power of 500 W.

3.2.13. 24 V Electronic Power Steering

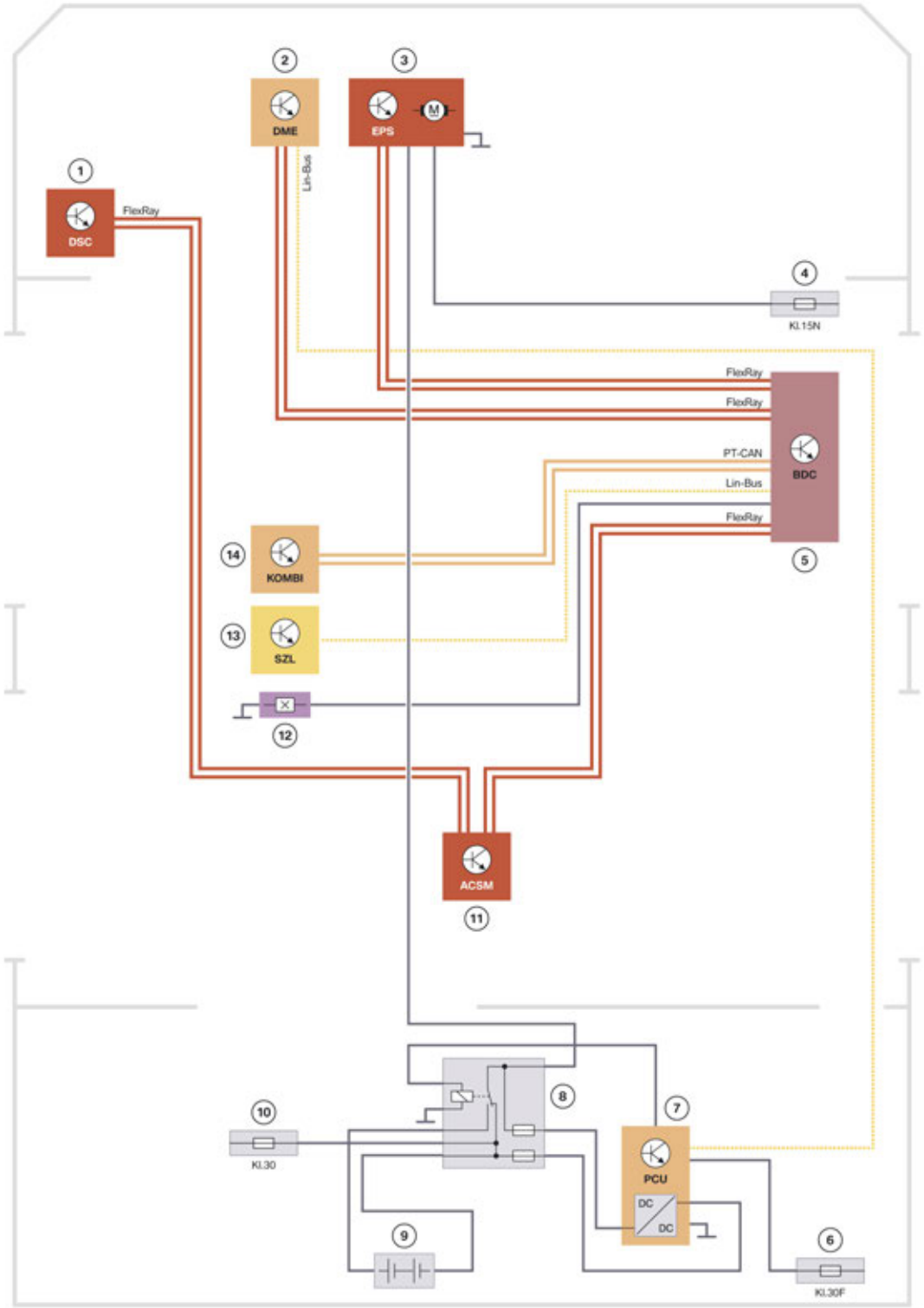
The higher weight 8-cylinder engine in the G12 results in a higher front axle load. This increases the effort that is required by the power steering servo. Due to these high currents, it is necessary to increase the voltage supply of the EPS to 24 V.

An auxiliary battery, separating element and a charging unit for the auxiliary battery are required for this. These components are installed in the luggage compartment of the G12.

The charging unit monitors the state of charge and charges the auxiliary battery using a DC/DC converter. It monitors a line shield of the 24 V line and various other conditions. The charging unit also switches the relay in the separating element, which integrates the auxiliary battery in the circuit. The EPS is supplied with 24 V only once this relay has been switched on. The EPS can also be operated with 12 V in the event of a fault.

G12 Voltage Supply and Bus Systems

3. Voltage Supply



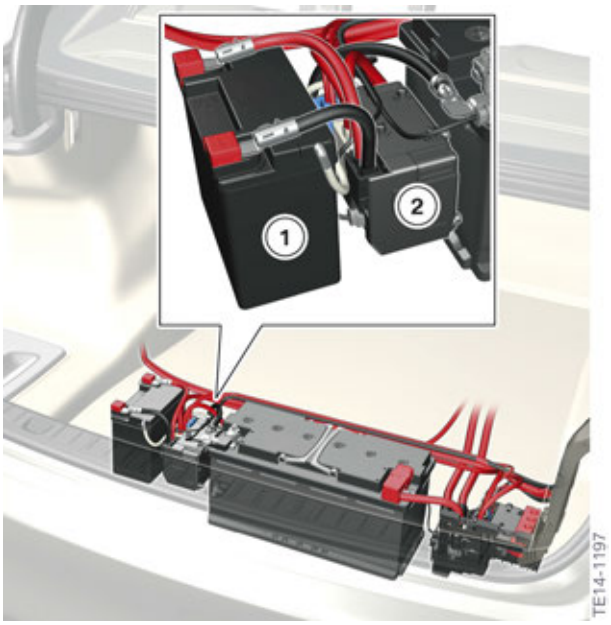
Voltage supply for 24 V steering

G12 Voltage Supply and Bus Systems

3. Voltage Supply

Index	Explanation
1	Dynamic Stability Control (DSC)
2	Digital Motor Electronics (DME)
3	Electronic Power Steering (electromechanical power steering) (EPS)
4	Fuse in the power distribution box, front right
5	Body Domain Controller (BDC)
6	Fuse in the rear power distribution box
7	Power Control Unit (PCU) 150 W
8	Separator
9	Auxiliary battery in the luggage compartment
10	Fuse in the power distribution box, battery
11	Advanced Crash Safety Module (ACSM)
12	Brake light switch
13	Steering column switch cluster (SZL)
14	Instrument panel (KOMBI)

Auxiliary battery with separating element



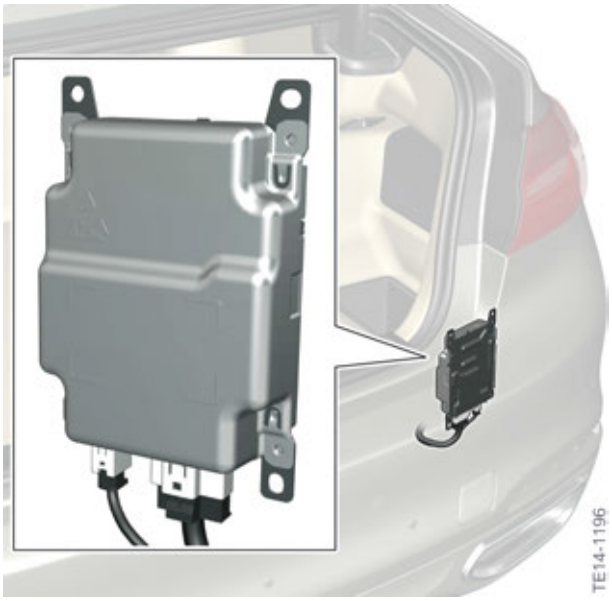
Battery and separating element

Index	Explanation
1	Auxiliary battery in the luggage compartment
2	Separator

G12 Voltage Supply and Bus Systems

3. Voltage Supply

Power Control Unit



150 W Power Control Unit

The Power Control Unit monitors the state of charge and also charges the auxiliary battery using a DC/DC converter.

G12 Voltage Supply and Bus Systems
4. Terminal Control

The terminal control in the G12 is different from other BMW models. The terminals are controlled via a customer-oriented condition management. In the G12, based on the customer's point of view, the vehicle is always in the right condition. The terminal control is dependent on the driving conditions.

4.1. Vehicle conditions

The G12 vehicle may be in the following conditions:

- PARKING (asleep)
- RESIDING (awake)
- DRIVING (ready)

The different vehicle functions are possible corresponding to the respective conditions.

PARKING (asleep)

- Customer not in the vehicle
- Vehicle secured or not used for a certain time
- Vehicle functions cannot be operated

RESIDING (awake)

- Customer in the vehicle
- No driving readiness
- Functions that are relevant when the vehicle is stationary can be operated

DRIVING (ready)

- Customer in the vehicle
- Driving readiness established
- All functions are available

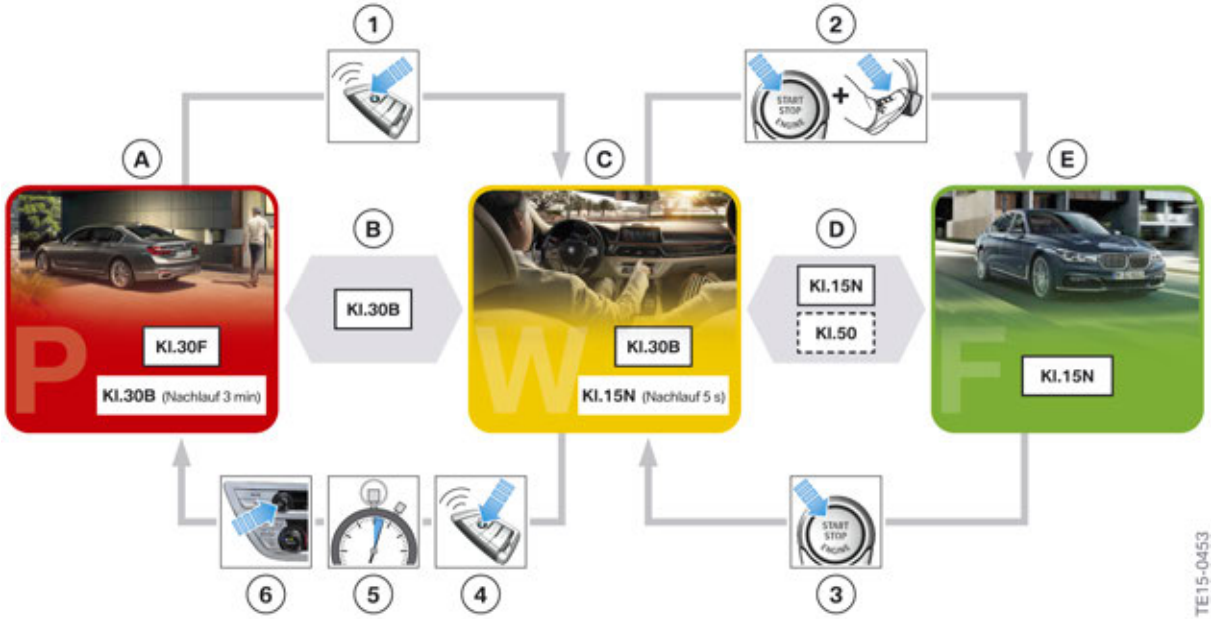
The driving conditions are changed by the condition management taking into account the customer behavior. Additional information is also evaluated to help determine the vehicle condition, e.g.:

- Door opening
- Door closing
- Operations in the vehicle

G12 Voltage Supply and Bus Systems

4. Terminal Control

The following diagram shows the changes between the vehicle conditions.



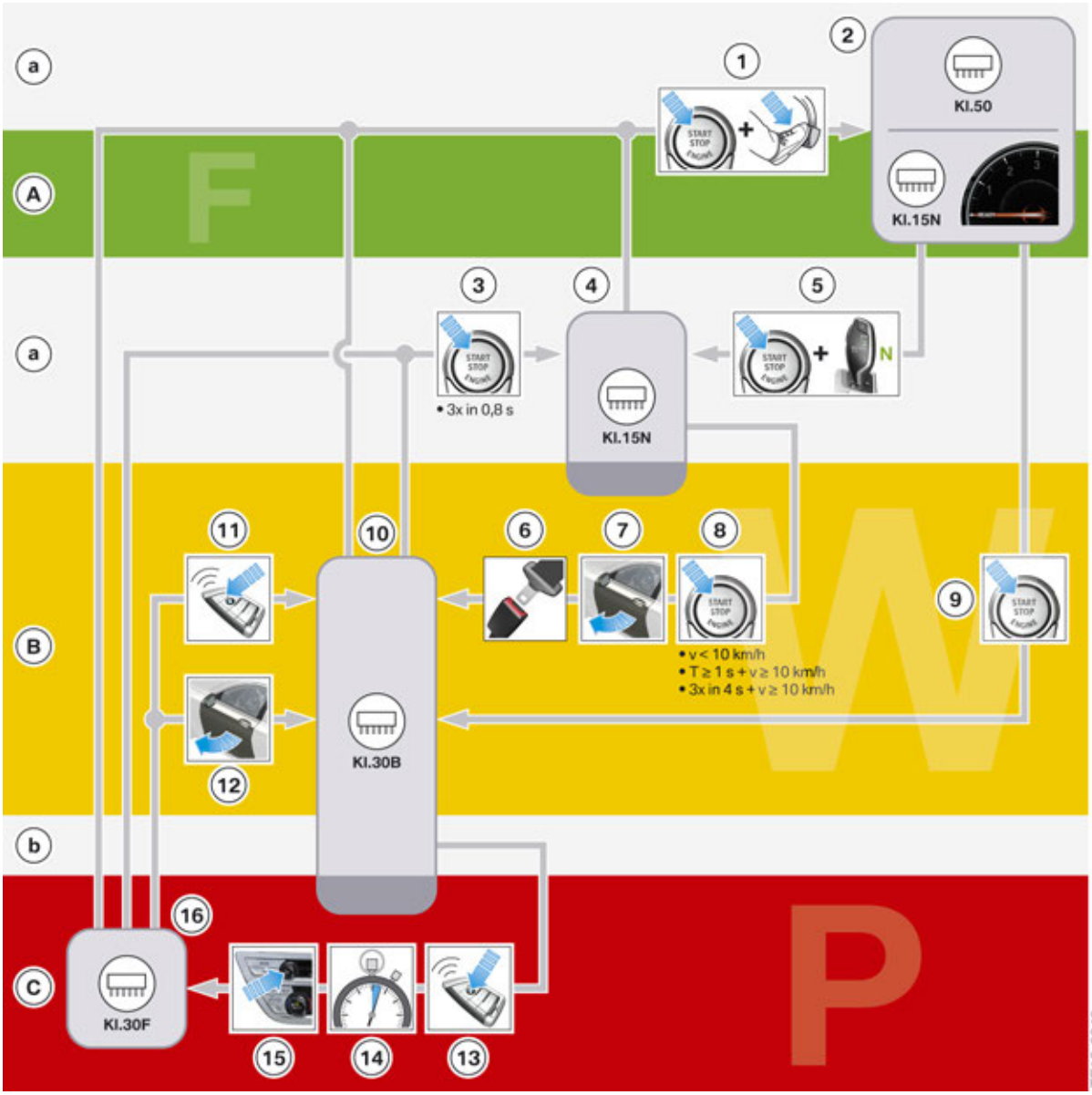
Vehicle conditions

Index	Explanation
A	Vehicle condition PARKING (asleep)
B	Transitional condition with stationary functions
C	Vehicle condition RESIDING (awake)
D	Transitional condition for establishing driving readiness or ending driving readiness or TESTING/ANALYSIS/DIAGNOSIS (PAD)
E	Vehicle condition DRIVING (ready)
1	Unlock vehicle
2	Operation of start/stop button + brake pedal
3	Press START-STOP button
4	Lock vehicle
5	No activity of a vehicle user detected for 3 minutes
6	Extended press

G12 Voltage Supply and Bus Systems

4. Terminal Control

Detailed overview of vehicle conditions.



Overview of vehicle conditions

Index	Explanation
A	Vehicle condition DRIVING (ready)
B	Vehicle condition RESIDING (awake)
C	Vehicle condition PARKING (asleep)
a	Transitional condition for establishing/ending driving readiness —TESTING/ANALYSIS/DIAGNOSIS (PAD)
b	Transitional condition with STATIONARY FUNCTIONS

Index	Explanation
1	Operation of start/stop button + brake pedal + valid remote control or valid ID transmitter in the vehicle interior
2	Driving readiness established, terminal 15N (terminal 50)
3	Operation of start/stop button (three times within 0,8 s) + valid remote control or valid ID transmitter in the vehicle interior
4	Terminal 15N
5	Operation of start/stop button + selector lever in Neutral
6	Unbuckling driver's seat belt (v < 0.1 km/h, driver's door opened, selector lever not in Neutral, brake not pressed, low beam off, no OBD communication, no diagnosis mode, no assembly mode)
7	Door contact change (v < 0.1 km/h, driver's seat belt undone, selector lever not in Neutral, brake not pressed, low beam off, no OBD communication, no diagnosis mode, no assembly mode)
8	Press start/stop button + vehicle is stationary or press start/stop button for at least 1 s + driving speed ≥ 10 km/h or press start/stop button at least three times within 4 s + driving speed ≥ 10 km/h
9	Press START-STOP button
10	Terminal 30B
11	Unlock vehicle
12	Residing interaction or stationary function interaction
13	Lock vehicle
14	No customer interaction for 3 minutes
15	Extended press of head unit media button
16	Terminal 30F

4.2. Power supply terminals

Control units in the vehicle must be supplied with power only when they are needed. The following terminals are used in the G12:

- Terminal 15N
- Terminal 30B
- Terminal 30F
- Terminal 30

Terminal 15N supplies control units which are needed only when driving and which may be needed to safely end a journey. After-run of 5 s starts at the transition from DRIVING to RESIDING.

Terminal 30B is used to supply control units that are needed in the stationary mode RESIDING and for stationary functions where the customer is not in the vehicle. An after-run starts at the transition from RESIDING to PARKING and terminal 30B is then switched off.

G12 Voltage Supply and Bus Systems
4. Terminal Control

Terminal 30F is used to supply control units which must perform functions in PARKING condition. Terminal 30F is normally switched on in PARKING condition, but may be switched off due to faults in the vehicle electrical system. The terminal is switched off with an after-running period of 1 min if a fault is detected.

Terminal 30 control units (e.g. alarm system) are always supplied with voltage and are also not switched off in the event of a fault.

	Terminal 30F	Terminal 30B	Terminal 15N
PARKING, vehicle electrical system not OK (fault in vehicle electrical system)	OFF	OFF	OFF
PARKING, vehicle electrical system OK	ON	OFF	OFF
Stationary functions, customer not in vehicle	ON	ON	OFF
RESIDING	ON	ON	OFF
DRIVING	ON	ON	ON

Testing Analysis Diagnosis (PAD)

The vehicle condition Testing/Analysis/Diagnosis is still present for diagnosis. All terminals are switched on in this mode. This ensures that diagnosis can be performed with all control units. This vehicle condition is displayed in the BMW diagnosis system.

4.3. Partial network operation

Today's premium vehicles contain up to 70 control units with well over 100 microcontrollers which are networked with each other. However, depending on the current vehicle condition or the vehicle user requirement, not all convenience and assistance systems need to be energized.

It is possible to save energy, relieve the load on the battery and also prolong the battery life by targeted deactivation and activation on control units which are not needed, so-called selective partial network operation.

If functions are not used or needed when driving, seat adjustment for example, the corresponding control units can be switched off.

In vehicles with combustion engines, the electrical energy consumption is indirectly linked to the fuel consumption via the alternator. As a result, selective deactivation of control units that are not currently needed can contribute to reducing fuel consumption and thus also CO_2 emissions.

4.3.1. Prerequisites for partial network operation

The partial network master in the Body Domain Controller calculates a partial network status on the basis of the current vehicle condition and the required functions. The control units that are not required are switched off by means of the corresponding bus messages.

4.3.2. Prerequisites of control units for partial network operation

Different transceivers are used in order to determine partial network operation in control units. These transceivers are able to evaluate and interpret messages. A control unit remains switched off as long as bus communication takes place without a valid wake-up event for the corresponding control unit. If a valid wake-up event for the corresponding control unit is sent on the bus, the transceiver can activate the voltage regulator of the microcontroller and the control unit starts up. The control unit is switched off by deactivation of the voltage regulator.

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